

Alan Boraas
<IFASB@kpc.alaska.edu>
02/24/2012 12:44 PM

To Kate Schofield, Glenn Suter, Jeff Frithsen
cc "catherinehknott@[REDACTED]"
bcc
Subject Boraas Knott Report

1 attachment



CulturalAssessment BoraasKnott.docx

Attached is our report
Thanks,
Alan and Catherine

**TRADITIONAL ECOLOGICAL KNOWLEDGE AND
CULTURAL ASSESSMENT OF THE NUSHAGAK AND
KVICHAK WATERSHEDS, ALASKA**

**Submitted to the Bristol Bay Assessment: Environmental
Protection Agency**

Alan S. Boraas, Ph.D.
Professor of Anthropology
Kenai Peninsula College
ifasb@kpc.alaska.edu
and
Catherine H. Knott, Ph.D.
Assistant Professor of Anthropology
Kenai Peninsula College
ifchk@kpc.alaska.edu

February 20, 2012

EXECUTIVE SUMMARY

1. Voices of the People

...Salmon more or less defines this area. It defines who we are. When you look at our art, you will see salmon....It is who we are. When you listen to the stories and take a steam, even in the middle of winter, people talk about salmon. It is in our stories; it is in our art. It is who we are; it defines us. M-61, 9/16/11

...we are relying on EPA to give us a fair shake out here. If EPA is going to crap all over our people, then take out the checkbook, federal government, and start writing million dollar checks for these people to move to Anchorage because you are going to kill us culturally, economically and every other way. M-60, 9/16/11

But I wouldn't trade this place for anything. This is home; this is where I find clean water to drink. M-51, 8/20/11

We love the place; it's home. Moving is not an option to me. M-29, 8/17/11

...basically one of the main purposes of the Blessing of the Water is to make that Holy water.... When the Father blesses that particular river, that particular river becomes Holy. M-61, 9/16/11

I think with us, during potlatch times, during hard times, or Russian Christmas, or if we gather together, everybody brings out their dry fish or their jarred fish or their salt fish. Nobody goes hungry, there's always sharing. F-32, 8/18/11

We share with our families, or if anybody does not have fish, we give them fish also. F-27, 8/17/11

2. The Condition of the Indigenous Cultures of the Bristol Bay Region

This section of the Bristol Bay Assessment is based on 53 interviews in seven villages and an overview of previous research in the study area. The condition of the ecosystems, both riverine and lacustrine, on which the Yup'ik and Dena'ina depend for wild fish, mammals, and plants including the keystone species salmon, is nearly pristine. The cultures have proved to be sustainable in this region for thousands of years. Alaska Department of Fish and Game statistics indicate wild subsistence resources including salmon provide the Yup'ik and Dena'ina of the

study area with the bulk of their food resources. Wild foods provide critical nutritional elements in both quantity and quality in the diet, but subsistence also forms the core of the culture itself, including knowledge, attitudes, practices, and beliefs important to the Yup'ik and Dena'ina people in their daily lives.

The villages of the study area are predominantly Native and the population remains stable (United States Census, Alaska). The culture has a remarkable degree of homogeneity; interviews conducted in this project relating to the importance and significance of salmon and clean water resulted in 97% concurrence among elders and culture bearers. The Yup'ik people of the region retain their language, and more than 40% of the population continues to speak it. The Dena'ina are undergoing a cultural renaissance through language revitalization programs and the emergence of culture camps. Both languages have a large number of words related to salmon and stream resources reflecting nuanced understanding developed over time.

Elders and culture bearers continue to instruct young people particularly at fish camps where not only fishing and processing techniques are taught, but also cultural values. The social system which forms the backbone of the culture, nurturing the young, supporting the producers, and caring for the elders, is based upon the virtue of sharing the wild foods harvested from the land and waters. Sharing networks extend to family members living far from home. The first salmon catch of the year is recognized with a prayer of thanks and shared in a continuation of the ancient First Salmon Ceremony.

The Yup'ik and Dena'ina consider the land and waters to be their sacred homeland. They have traditionally considered the salmon as kin in the sacred web of life. The populations of both Yup'ik and Dena'ina have shown themselves to be spiritually tenacious, combining elements of

traditional practices with those of Russian Orthodox and other Christian churches to create a rich syncretic religious heritage for their families. The rivers are blessed by priests annually in the Great Blessing of the Water at Theophany, celebrating the baptism of Christ. This ceremony, for Orthodox Yup'ik and Dena'ina, is the pure element of God expressed as sanctified nature. The holy water of the rivers derived from this ceremony is used to bless the homes, churches, and people and is believed to have curative powers.

3. The Status of the Resource Relative to other Salmon Culture Ecosystems Internationally

The Human Relations Area Files on-line cultural database identifies 23 world cultures in which anadromous salmon are or were a chief component of subsistence. The Yup'ik and Dena'ina of the study area are among the few, perhaps the only, remaining cultures to still rely on wild salmon as a chief source of nutrients and have an intact relationship with the landscape that supports them.

The salmon cultures of the Pacific Northwest have been dealing with significantly degraded salmon resources for the last fifty years or more. Of the remaining salmon-based cultures of the world, the Saami of Fennoscandia and the Ainu of Japan are examples of the many cultures that are no longer wild salmon-based cultures because their environments have been industrialized, dammed and degraded, access to salmon has been made illegal, high-seas fishing has destroyed salmon populations, and salmon populations have been contaminated with farmed salmon.

4. The Causes of the Unique Status of the Resource and the Vulnerability of the Resource

This area is among the last remaining truly viable cultural and ecologically interdependent human/salmon ecosystem in the world because it is an intact ecosystem largely due to the fact that it is remote, roadless, and until recently, not thought to contain natural resources of value other than fish and game. In addition the unique Alaska State and United States Federal subsistence laws protect the indigenous people's right to harvest wild resources.

5. Vulnerabilities

The existing culture of the indigenous people of the study area is vulnerable to any project or policy that changes the quantity or quality of wild salmon resources or the quantity or quality of water in the Nushagak or Kvichak watersheds. Impacts to salmon would leave the existing culture susceptible to destabilization and impact its present ability to cope with natural disasters. If significant impacts to salmon or streams occur, the cultural stability will be vulnerable to change in the following ways:

- Since the diet is heavily dependent on wild foods, particularly salmon, the diet would be significantly changed from highly a highly nutritious diet to one based on store-bought processed foods.
- Since the social networks are highly dependent on procuring salmon (fish camps) but also sharing salmon and wild food resources, the current social support system would be significantly degraded

- Since significant, meaningful family-based work takes place in fish camp or similar subsistence settings, transmission of cultural values and language learning would be impacted and family cohesion impacted.
- Since values and the belief system are represented by interaction with the natural world through salmon practices and clean water practices and symbolic rituals, core beliefs would be challenged potentially resulting in a breakdown of cultural values, mental health degradation and behavioral disorders.
- Since Alaskan state and federal subsistence law currently rests on rural and urban designations, a significant increase in population potentially would result in loss of subsistence rights if an area were re-designated “urban.”
- Since a yearly subsistence round rests on having time to harvest and process wild foods, a shift from part-time wage employment to full-time wage employment would impact subsistence-gathering capabilities.
- Since the area exhibits a high degree of cultural uniformity tied to shared subsistence practices, significant change could provoke increased discord both between villages and among villagers.

I.	INTRODUCTION	9
A.	Overview	9
B.	Villages, Population, and Ethnicity	14
II.	CULTURAL AND HISTORICAL BACKGROUND	18
A.	Pre-Contact Bristol Bay	18
1.	Voices of the People.....	18
2.	Introduction	18
3.	Pre-Contact Salmon Fishing Cultures	21
B.	History and Culture of the Yup'ik Area	29
1.	Voices of the People.....	29
2.	Introduction	31
3.	Pre-Contact Culture.....	31
4.	Post-Contact History and Culture (A.D. 1791 to 1935).....	33
C.	History and Culture of the Dena'ina	40
1.	Voices of the People.....	40
2.	Pre-Contact Culture.....	41
3.	Post-contact History and Culture	43
D.	Traditional Yup'ik and Dena'ina Spirituality and Cosmology	46
1.	The Yup'ik People	46
2.	The Dena'ina People	51
E.	The Yup'ik and Dena'ina Languages: Salmon and Streams	55
1.	Voices of the People.....	55
2.	Introduction	55
3.	The Central Yup'ik Language.....	56
4.	The Dena'ina Language	65
III.	MODERN CULTURE	77
A.	Interview Synopsis.....	77
A.	Subsistence.....	82

1. Voices of the People.....	82
2. Introduction	84
3. Subsistence in Alaska.....	85
4. Scope of Subsistence	88
5. The Seasonal Subsistence Round.....	93
6. The Interplay of Subsistence and Wage Income	94
7. Subsistence as an Economic Sector	97
8. Subsistence and “Wealth”	99
B. Physical and Mental Well-being: the Role of Subsistence	100
1. Voices of the People.....	100
2. Introduction	102
3. Nutrition	103
4. Fitness.....	105
5. Disease Prevention	107
6. Local Wild Fish.....	109
C. Traditional Ecological Knowledge	111
1. Voices of the People.....	111
2. Introduction	111
D. Social Relations	119
1. Voices of the People.....	119
2. Introduction	122
3. Sharing and Generalized Reciprocity.....	122
4. Fish Camp	124
5. Steam Baths.....	126
6. Gender and Age Equity	126
7. Wealth	126
E. Spirituality and Beliefs Concerning Water and Salmon	128
1. Voices of the People.....	128
2. Introduction	130
3. Great Blessing of the Water	131

4.	Respect and Thanks.....	134
5.	First Salmon Ceremony.....	134
F.	Messages From the People.....	136
1.	Voices of the People.....	136
IV.	CULTURAL VULNERABILITY.....	139
A.	Introduction.....	139
B.	World Risk Index.....	142
C.	Exposure	145
D.	Susceptibility.....	147
1.	Subsistence	148
2.	Physical and Mental Well-being	152
3.	Traditional Ecological Knowledge (TEK)	157
4.	Social Relations	158
5.	Spirituality and Values	163
E.	Coping Capacity.....	164
F.	Adaptive capacity.....	172
G.	Summary of WRI Assessment	183
V.	SELECTED CASE STUDIES	186
A.	Overview	186
B.	Sámi of Fennoscandia	186
C.	Ainu of Hokkaido, Japan	193
D.	Papua New Guinea: The Ok Tedi Mine.....	198
VI.	REFERENCES CITED	202

I. INTRODUCTION

A. Overview

The purpose of the Bristol Bay Cultural Assessment is to provide information to the Environmental Protection Agency on the status of the indigenous cultures of the Nushagak and Kvichak River watersheds and their dependence on and relationship to salmon and other stream-based natural resources of the region. The focus of the Bristol Bay Assessment is salmon and water and this part of the overall assessment portrays the human dimension of modern indigenous “salmon-cultures” of the region. The Human Relations Area Files on-line cultural database (<http://www.yale.edu/hraf/collections.htm>) identifies 23 cultures in which anadromous salmon are or were a chief component of subsistence. The Yup’ik of the Nushagak and Kvichak River watersheds and the Dena’ina of the Lake Iliamna, Newhalen River and Lake Clark (also the Kvichak River watershed) and among the remaining cultures still relying on wild salmon as a chief source of nutrients. This reliance on salmon has lasted unbroken for 4000 years and salmon subsistence has shaped cultural patterning in multiple ways. Today modern technology is used but many beliefs, social practices and components of spirituality are part of this long history and form both Yup’ik and Dena’ina essential identity and provide the cultural basis for sustainability. To say they are the last wild salmon cultures is an overstatement, but they are certainly among the last. Part of the reason they remain is that Alaska in general, and Bristol Bay in particular, has become the world’s last bastion of wild, non-farmed, non-hatchery raised, wild salmon.

This study contains five parts. First, this introduction contains information about the project and its methodology. Second, it consists of contextualization of relevant prehistoric, historic, linguistic, and cultural information obtained from anthropological, historical, and other publications and data bases. Between us (Boraas and Knott) we have 48 years of research, teaching, and collaboration with Alaskan tribes, and that experience is reflected in this study. Third, this document includes the product of interviews in villages of the Nushagak and Kvichak River watersheds conducted in 2011, which constitutes original research on the peoples of the area. Fourth, this document contains an assessment of the vulnerability of the culture to industrial resource extraction in the Bristol Bay area. These vulnerabilities are framed in the context of the World Risk Assessment and are intended to provide information for the Environmental Protection Agency to make that risk assessment. Fifth, this document contains a section on selected cultural case studies pertaining to salmon and water.

As a foundation for this research, all of the federally recognized villages in the watersheds were contacted through the Environmental Protection Agency's Tribal Liaison Office in Anchorage following government to government protocols. Since one of us, Alan Boraas, is an Honorary Member of the Kenaitze Indian Tribe, a letter of introduction from the Kenaitze Tribe to village councils was included in the government to government packet following village protocols. We selected seven villages in which to conduct interviews: New Stuyahok, Koliganak, Curyung (Dillingham), Nondalton, Pedro Bay, Newhalen, and Iliamna. Time and funding prevented us from conducting interviews in Igiagik, Levelok and Ekwok. Kokanok and Port Alsworth did not respond to the government to government request to conduct interviews.

Table 1 Number of Interviews per Village.

Village	Males	Females	Total
Curyung (Dillingham)	7	0	7
Iliamna	1	3	4
Koliganak	5	5	10
Newhalen	5	6	11
New Stuyahok	5	2	7
Nondalton	4	6	10
Pedro Bay	2	2	4
Total	29	24	53

We interviewed 53 elders and culture bearers, people whom the village councils or tribal governments recognize as authoritative sources of information about subsistence, traditional ecological knowledge, social relations and spiritual aspects of their culture. The village-selected interviewees consisted of 24 females and 29 males (see Table 1) and ranged in age from mid-twenties to a man reportedly in his nineties. Most, however, were in their forties or older due to the intentional weighting toward village-selected elders and culture bearers. We were not consulted in the selection of specific interviewees and were assisted by a tribal employee or a village council member who arranged the time and place of the interview (see Appendix 1, Methodology). The interviews took place in public tribal or community centers or private homes because from the standpoint of the interviewees they are safe, non-threatening places in which to discuss important cultural matters. We normally interviewed two to four individuals at any one time but some sessions included as many as six and one was a single interviewee. The interview session lasted about two hours with a short break. Interviews followed a standard semi-structured interview process in which a set of questions guided the interview but interviewees were free to add additional information or perspective, in some cases delving into topics not covered by the original question. The questions were specifically designed not to be answered briefly but to

probe the subject and allow interviewees to describe cultural structures which for the most part were familiar and obvious to local villagers, but not commonly understood to others, particularly those outside the state. If a response was brief we would respectfully clarify or amplify upon the question to generate a more complete narrative. Interviewees were told they did not have to respond to a question if they chose to, although none did. If an interview session exceeded two hours we occasionally eliminated some questions. If the topic of a question had already been covered in a previous discussion we eliminated the question. Not all interviewees responded to every question. Regularly one person would respond and others would nod agreement. Since the questions dealt with a cultural standard, there were few alternative points of view. Some of the interviewees chose to speak in Yup'ik, in which case an interpreter was present to translate the question into Yup'ik and the response into English. None chose to speak in Dena'ina. Many Elders "think" in their Native language which we encouraged because responding in the traditional language generates more accurate and nuanced responses to questions about culture.

We digitally recorded the interviews and, in the Kenai Peninsula College Anthropology Lab, made transcriptions from the recordings including both responses to our questions and additional perspective provided by the elders or culture bearers. The recordings and transcriptions will be archived both in the Kenai Peninsula College Anthropology Lab and the Lake Clark National Park Archive.

The interview questions revolved around the theme of, "How are salmon and other stream-based resources and water important in your lives?" The questions involved the topics of nutrition, subsistence, social relations, spirituality and beliefs. In addition a final question was

asked: “is there anything you would like to add, or is there anything you would like the Environmental Protection Agency to know about the situation in your village.”

The transcribed interviews were lumped into a single Microsoft Word document and the lumped document was searched for key words related to the sub-headings of this report using the powerful search feature of Microsoft Word 2010. In this way we were able to capture responses both to the theme of the question we asked and to that theme that might have been discussed by interviewees in the context of a question related to a different topic. In this document responses of elders and culture bearers titled “Voices of the People,” reflecting both the consensus among those interviewed and the deviations from consensus appear in italics before the anthropological discussion of each section. By the standards of highly pluralistic modern America, the Yup’ik and Dena’ina villages of Southwest Alaska are culturally much more homogenous, consequently the narratives reflect that homogeneity. “Voices of the people” statements were selected through the search process described above because they were concise, clear, and reflected the intent of the speaker in the context of their broader narrative. The English response or translation is transcribed “as is” with no grammatical modification; readers must understand that for some, English is a second language and imperfect English grammar is not to be construed as imperfect or naive thinking. Following University of Alaska Institutional Review Board Standards, to protect individual identity of the interviewees, each elder or culture bearer has been designated by a code, using an “M” or “F” for “male” or “female” and a number, along with the date of the interview.¹ Only we the interviewers know the names of the interviewees.

¹ Funding for this project was administered as a grant through the University of Alaska Anchorage/Kenai Peninsula College and came under Institutional Review Board (I.R.B.) auspices since it involved human subjects. The UAA I.R.B. reviewed and approved the

All deviations from consensus have been included in the qualitative “Voices of the people” responses. In addition, the entire 500 page typed narrative was assessed from a favorable/unfavorable or agree/disagree standpoint to give a sense of the degree of conformity to a response. These results, along with the interview questions, are portrayed in Section III.A. and referenced throughout this document to give a quasi-numerical sense of the culture standards of the Nushagak and Kvichak drainages.

B. Villages, Population, and Ethnicity
[map placeholder]

In the 2010 United States Census, Alaska the 13 communities of the study area had a total population of 4118. Table 2 describes the population characteristics of the 13 villages and towns located in the Nushagak and Kvichak River drainages.

methodology, consent forms and research design of this project. I.R.B. stipulates protection of the identity of human subjects, consequently the names of the participants of this study and not revealed. Signed consent forms are held by the researchers.

Table 2. 2010 Census of the Towns and Villages of the Nushagak and Kvichak River Drainages. (data from U.S. Census, Alaska; Alaska Community Database)

Drainage	Community	2010 Population	% Native	Ethnic Majority
Nushagak River	Dillingham	2,329	55.9	Yup'ik
	Ekwok	115	90.4	Yup'ik
	Koliganek	209	95.7	Yup'ik
	New Stuyahok	510	93.5	Yup'ik
	Portage Creek	2	50.0	Yup'ik
Kvichak River	Igiugig	50	40.0	Yup'ik
	Iliamna	109	54.1	Dena'ina
	Kokhanok	170	80.0	Yup'ik/Dena'ina/Alutiiq
	Levelock	69	84.1	Yup'ik
	Newhalen	190	80.0	Yup'ik
	Nondalton	164	63.4	Dena'ina
	Pedro Bay	42	66.7	Dena'ina
	Port Alsworth	159	21.4	Caucasian
	Total	4118		

Of the 13 communities, three are anomalous: Dillingham, Port Alsworth, and Iliamna.

Dillingham has, by far, the largest population in the area (2,329 in 2010) and is a regional center, with an economy based on the Bristol Bay commercial fishing industry, as well as government services, transportation, and professional and business services (Alaska Community Database).

Dillingham has a small branch of the University of Alaska, a museum, and Alaska Department of Fish and Game (ADFG) offices, as well as several stores, churches, hotels, and other institutions typical of mid-sized Alaskan towns. Dillingham, however, is 55.9% Alaska Native—mainly

Yup'ik—and the Curyung Tribe and Bristol Bay Native Corporation and associated agencies are a significant presence (Alaska Community Database).

Port Alsworth is only 21.4% Native and thus does not have the majority or near-majority Native population that other villages in the study area have. The non-Native population is primarily associated with two institutions. The Lake Clark National Park and Preserve, which surrounds Lake Clark, has its regional headquarters in Port Alsworth. Because of the park, a number of eco-tourism guides unaffiliated with the park but using its resources are headquartered at Port Alsworth. The Tanalian Bible Camp and associated ministries, loosely connected to Samaritan's Purse, a national fundamentalist Christian ministry directed by Rev. Franklin Graham, is also located at Port Alsworth. Yup'iks who relocated to the area in 1944 (Gaul, 2007) account for most of the town's Native population and make up its ANSCA-based village corporation, Tanalian Inc. (Port Alsworth is well within traditional Dena'ina territory).

Iliamna is the third anomalous village. A traditional Dena'ina village located on Iliamna Lake, it now is a growing center for guided sport hunting and fishing. It has also become a staging area for exploration and other activities associated with proposed copper/gold porphyry mines in the area. Consequently, Iliamna has a proportionately larger non-Native population than other villages in the area (except Port Alsworth), although the Native population (54.1%; Alaska Community Database) outnumbers other ethnic groups, and is still the dominant ethnic group.

The remaining study area communities are Yup'ik or Dena'ina villages with close connections to traditional practices. They are relatively small, with populations ranging from 510 (New Stuyahok) to 50 (Igiugig; Portage Creek, population 2, is reportedly seasonally occupied as of 2011, according to interviewee M-26), and from 93.5% Native (New Stuyahok) to 40%

Native (Igiagig). Most have a single church (Russian Orthodox), a public school, a health clinic, an airstrip, a small general merchandise store, a post office, and a tribal center or village corporation center.

II. CULTURAL AND HISTORICAL BACKGROUND

A. -Pre-Contact Bristol Bay

1. Voices of the People

Salmon and fresh water has been the lifeline of the people here for thousands of years. If you look at the water, that is why fish and game has survived so well here, because we have such clean water. M-62, 9/16/11

[If the salmon were to be impacted], it would stop 10,000 years' plus tradition, culturally and spiritually for my people; not only my people, all the other communities and villages in this region will go away. We would cease to exist. We can't go anywhere. Where are we going to go? M-33, 8/18/11

Freeze drying is not a new thing. That's been going on with my people for over 10,000 years, eating freeze dried food. M-33, 8/18/11

There's 10,000 cache pits [at the Kijik archaeological site on Lake Clark] and they are still counting; over 200 houses, which are huge. So it was pretty big. M-29, 8/17/11

My father, he usually keeps fresh salmon. He would dig a pit and take the topsoil off; dig it out lay some grass on the bottom and on the side. Then take the salmon, lay them in the pit until he filled it up. Then he would put grass on top of it. Then he would lay gravel right on top of it, and he would mark each corner for winter time. Put poles on each corner so he could find where he buried his salmon. And in the winter time, if he wanted salmon, he would take his axe and cut out a piece of the soil and dig from there. That was his freezer. That is how my dad would keep salmon. M-54, 8/20/11

2. Introduction

The pre-contact history (prehistory) of the Bristol Bay drainage is not as well documented as in other parts of Alaska. The archaeological work is largely due to five projects. In the 1960s James Van Stone conducted an archaeological survey of the Nushagak River as part of ethnohistoric research (VanStone 1967); B.I.A. archaeologists have conducted archaeological surveys in connection with Native Allotment assessments; Lake Clark National Park has

conducted various survey projects on the Mulchatna River and areas above treeline; the Pebble Partnership has contracted for archaeological surveys on the footprint of a proposed Pebble Mine site; and the Alaska Office of History and Archaeology has conducted or required pre-development archaeological surveys on proposed airstrips and other improvements and conducted townsite surveys. Within the study area there are a total of 228 historic and prehistoric sites listed on the Alaska Heritage Resources Survey (A.H.R.S.), the state's database for officially designated sites. To better understand the patterns of culture change and establish the time-depth of salmon use in the Nushagak and Kvichak River drainages one of us (Alan Boraas) generated a database of the 228 sites and from that developed a prehistoric cultural chronology of which the last 4000 years are depicted in Figure 1.

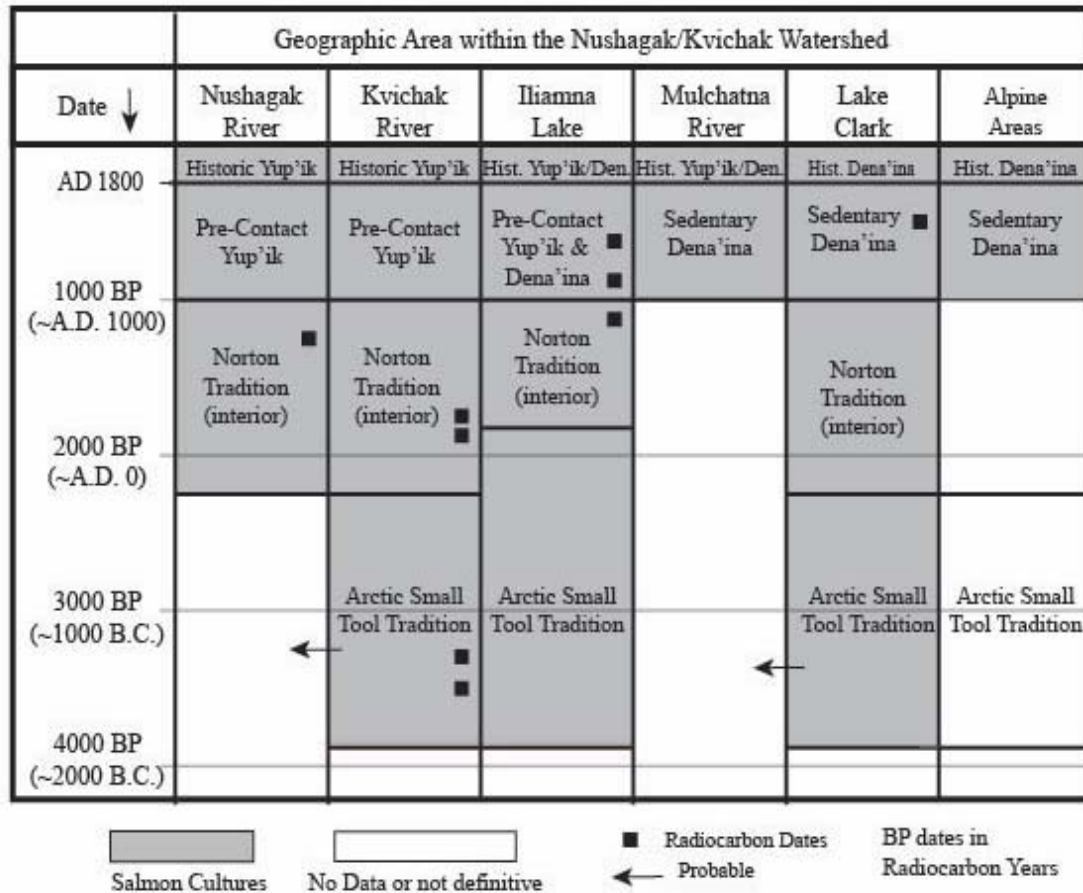


Figure 1. Cultural Chronology of Nushagak and Kvichak River Drainage Salmon-Based Cultures. From Alaska Heritage Resource Survey database. By Alan Boraas

The “BP” (Before Present) of the y-axis of Figure 1 is in uncalibrated radiocarbon years and an approximate B.C./A.D. date is indicated.² AHRS site data was assembled for six regions within the Nushagak and Kvichak River drainages, including:

- The Nushagak River from its mouth to headwaters.
- The Kvichak River, including nearby archaeological sites in the Alagnak River drainage.
- The shoreline of Iliamna Lake and the lower Newhalen River.
- The Mulchatna River, upstream to Bonanza Creek.
- Lake Clark, Sixmile Lake, and the Upper Newhalen River.
- Alpine areas above tree line north of Iliamna Lake and west of Lake Clark.

3. Pre-Contact Salmon Fishing Cultures

The study area was occupied as early as 8,000 BP by core and microblade makers of the Paleoarctic tradition (with two Putu-like fluted points coexisting with microblades at one site, XHP-00430 extending the possible time range to 12,000 BP). Subsequently archaeological cultures of the Northern Archaic and Ocean Bay traditions occupied the area. None involved intensive salmon fishing as indicated by AHRS records. The Paleoarctic and Northern Archaic sites are associated with Athabascans (Boraas 2007: 34-7) and establish a time-depth for the Dena’ina or proto-Dena’ina in the study area.

² The deviation between calibrated calendar years and uncalibrated radiocarbon years becomes significant before 1500 B.C. By 2000 B.C. uncalibrated radiocarbon years are ~ 400 hundred years too old (<http://www.radiocarbon.com/calendar-calibration-carbon-dating.htm>).

As described below, archaeological records indicate Yup'ik or proto-Yup'ik people have been fishing for salmon for at least 4,000 years (Figure 1 and Table 3) and may be genetically related to earlier Siberian salmon fishers. Salmon fishing first appears with the Arctic Small Tool tradition (ASTt) (see Figure 1) and Table 3 is a list of ASTt sites in the study area. ASTt cultures are widespread in western and northern Alaska where the site data indicates the existence of interior nomadic hunters (primarily caribou) or coastal sea mammal hunters. In the Bristol Bay drainage, ASTt, three village sites, evidenced by ASTt-style houses and artifacts, are found on the Kvichak River. Five alpine sites (artifacts only) indicate hunting above treeline. The houses are permanent structures, generally measuring four meters on a side, indicative of sedentary or semi-sedentary people and are located adjacent to salmon spawning streams. The ASTt site at Igiugig (ILI-00002), where the Kvichak River flows out of Iliamna Lake, is an example of such a site (Holmes and McMahan, 1996).

Table 3. Arctic Small Tool tradition sites in the Study Area. Compiled From Alaska Historic Resources Area Files

ARCTIC SMALL TOOL TRADITION AD 200 to 1800 BC			
Area	AHRS Site	Characteristics	Houses
Nushagak R.	NAK-00018, B	cores and microblades	
Iliamna Lake	ILI-00035	Lithic tools	
Alpine	ILI-00201	Microblade core	
Alpine	ILI-00205	Microblade core	
Alpine	ILI-00193	Lithic camp: microblades, side blades, end scrapers, knives.	
Alpine	ILI-00219	Microblade core	
Alpine	ILI-00218	Microblade core	
Kvichak	DIL-00088	Village, sedentary houses; C14 Date, 3580+/-150; ASTt probable based on date	19
Kvichak	DIL-00170	Village; Brooks River Gravel Phase	2
Kvichak	ILI-00002	Cores, microblades, burins, notched stones, 4000 artifacts; Brooks River Gravel phase, ca 1800 BC to 1100 BC 3350+/-60 BP radiocarbon date, possible Norton component	
Kvichak	ILI-00072	Microblades and other lithics	
Kvichak	ILI-00206	Village site	1

Anadromous salmon remains, while not common, occur in ASTt sites (Dumond, 1984), suggesting salmon were a significant subsistence human resource in riverine and lacustrine areas of southwest Alaska. The lack of abundant salmon bones in ASTt sites may be due to small populations of salmon, decomposition of the relatively delicate bones, or the practice of

returning salmon bones to the water—similar to ethnographic Yup'ik and Dena'ina—thereby contributing to marine-derived nutrients important in salmon habitats. Further research is necessary to clarify this point. That one site (DIL-00088) contains 19 sedentary houses and is located along a salmon stream indicates salmon were a primary resource.

Analysis of human hair from a 4,000-year old ASTt site in Greenland places the mitochondrial DNA (mtDNA) in the D2c haplogroup reflecting Siberian origins (Gilbert et al., 2008). Today, haplogroup D2c is present, but haplogroup A is dominant among Yup'iks; haplogroup A also has Siberian origins where researchers place its origin as early as 7,000 years before present (Rubicz et al., 2003). Both haplogroups indicate that the time-depth of Yup'ik people in southwest Alaska is at least 4,000 years and that they derive from Siberian origins, where their ancestors were also potentially salmon fishers. As described in the section on nutrition (III.C.3.), evidence is building that Yup'iks are biologically adapted to salmon and 4000 years is the temporal context in which that evolution took place.

In all but the Mulchatna River and alpine areas where evidence has yet to be found, the Arctic Small Tool tradition is followed by a well-developed salmon culture, the Norton tradition, dating from ~300 B.C. to A.D. 1000 (see Figure 1; Table 4). Like ethnographic Yup'ik, the Norton tradition has both a coastal and interior subsistence orientation. The coastal Norton tradition is found in sites as far north as Cape Denbeigh and relied primarily on marine mammals (Dumond 1984: 99-101). The interior Norton tradition sites, such as those in the study area on the Nushagak and Kvichak Rivers and Lakes Iliamna and Clark, had a salmon-oriented subsistence culture based on the following evidence: archaeological features, mainly houses, similar to those at ethnographic Yup'ik salmon fishing sites: large sedentary villages, villages

located adjacent to salmon fishing locations, and net fishing artifacts. Riverine Norton tradition sites are similar to ASTt sites in that they consist of large, permanent houses located on salmon streams. One large Norton tradition site on the Kvichak River (DIL-00161) consists of 34 to 45 houses representing a population sustainable only through the availability of abundant resources such as anadromous salmon. In addition, the artifact inventory for the eight Norton village sites in the study area (see Table 4) contains notched stones that were used as net weights, similar to the lead line of a modern net (Dumond, 1987:11). In addition to dwelling houses, Norton sites in southwest Alaska contain large structures indicating a *kasheem* or *kazigi*, (local pronunciations vary), a men's house also found among pre-contact and early historic Yup'ik villages. These finds indicate that the Bristol Bay drainage Norton culture were Yup'ik or proto-Yup'ik speakers and relied on salmon as their primary subsistence food.

Table 4. Norton tradition sites in the study area. Compiled from Alaska Heritage Resources Survey data by Alan Boraas.

NORTON TRADITION AD 1000 TO 300 BC			
Area	AHRS Site	Characteristics	Houses
Kvichak	DIL-00161	Prehistoric village (6100 artifacts) 1760+/-40 BP	34-45
Kvichak	DIL-00174	Two large house depressions; Smelt Creek Phase 1920+/-40	2
Kvichak	DIL-00175	Village site, artifacts, pottery; Norton Brooks River Weir and Brooks River Falls phases, 1830+/-40 BP	8
Kvichak	DIL-00229	Prehistoric Village	1
Kvichak	ILI-00073	Village site, Pottery,	4
Kvichak	DIL-00207	Village, 43 house depressions; lithics and ceramics	43
Iliamna Lake	ILI-00056	Village, C14 date 860+/-60	12-15
Iliamna Lake	ILI-00127	Pottery and stone beads	
Iliamna Lake	ILI-00128	Weir, Early Norton	
Iliamna Lake	ILI-00098	Village, cache pits no houses apparent on surface, fiber pottery	
Lake Clark	ILI-00012	Village	12
Lake Clark	XLC-00086	Bifaces, scrapers, sideblades, fiber pottery.	

It is not clear how long the Dena'ina have been salmon fishers, but about A.D. 1000, the Dena'ina of the Mulchatna River and Lake Clark areas developed a method to catch salmon using weirs and began storing salmon in underground cold storage pits called *elnen tugh* (Kenai dialect) that appear in the archaeological record. (Boraas 2007). Salmon storage technology spread to Iliamna Lake, Cook Inlet, and the Susitna and middle Copper River areas (Boraas, 2007). A proliferation of Dena'ina sites—65 have been found to date far more than any other pre-contact period—occurs in the study area, dating to just after A.D. 1000 (Table 5 and Lynch,

1982). Forty-one sites are village sites (not necessarily occupied simultaneously and the Kijik Site, XLC-00084 and associated sites, is among the largest in Alaska for the prehistoric period.

We can conclude that weir fishing and the underground cold storage technology described in the pre-contact culture section (II.C.2.) below was an extremely successful adaptation.

Table 5. Pre-Contact or Early Contact Period Dena'ina Sites in the Study Area. Compiled from Alaska Heritage Resources Survey data by Alan Boraas.

SEDENTARY DENA'INA AD 1000 TO AD 1800			
Area	AHRS Site	Characteristics	Houses
Mulchatna River	XLC-00072	Village	1
Mulchatna River	XLC-00076	Village	2
Mulchatna River	XLC-00078	Cache pits	
Mulchatna River	XLC-00074	Village, Dena'ina	1
Mulchatna River	XLC-00075	Village, Dena'ina	1
Mulchatna River	TAY-00046	Cache pits	
Mulchatna River	TAY-00026	Cache pits	
Mulchatna River	TAY-00030	Cache pits	
Mulchatna River	TAY-00027	Cache pits	
Mulchatna River	TAY-00031	Cache pits	
Mulchatna River	DIL-00200	Cache pit	
Mulchatna River	DIL-00201	Cache pit	
Iliamna Lake	ILI-00029	Fish camp	
Iliamna Lake	ILI-00046 B	Village Complex	

Iliamna Lake	ILI-00019	Village site	3
Iliamna Lake	ILI-00135	Cache pit	
Iliamna Lake	ILI-00021	Village	nd
Iliamna Lake	ILI-00020	Village, houses undetermined	nd
Iliamna Lake	ILI-00001 A	Village	5
Iliamna Lake	ILI-00047	Cache pits	
Iliamna Lake	ILI-00049	Village	4
Iliamna Lake	ILI-00018 B	Village 560+/-60 BP	nd
Lake Clark	XLC-00048	Cache pits	
Lake Clark	XLC-00057 A	Prehistoric Village	30
Lake Clark	XLC-00102	Village	10
Lake Clark	XLC-00167	Village	5
Lake Clark	XLC-00166	Village	2
Lake Clark	XLC-00094	Village	19
Lake Clark	XLC-00165	Village	2
Lake Clark	XLC-00164	Village	2
Lake Clark	XLC-00155	Village	5
Lake Clark	XLC-00163	Village	1
Lake Clark	XLC-00162	Village	2
Lake Clark	XLC-00101	Village	11
Lake Clark	XLC-00100	Village	14
Lake Clark	XLC-00099	Village	2
Lake Clark	XLC-00084	Village (possibly two sites)	95
Lake Clark	XLC-00092	Village	13
Lake Clark	XLC-00090	Village; C14 BP 300+/-60	10
Lake Clark	XLC-00091	Village	4
Lake Clark	XLC-00093	Village	1
Lake Clark	XLC-00021	Cache pits	
Lake Clark	XLC-00020	Village	2
Lake Clark	XLC-00012	Village	2
Lake Clark	XLC-00013	Trapper cabin	
Lake Clark	XLC-00159	Village	3
Lake Clark	XLC-00158	Village	2
Lake Clark	XLC-00104	Village	1
Lake Clark	XLC-00157	Village	3
Lake Clark	XLC-00156	Village	12

Lake Clark	XLC-00105	Village	10
Lake Clark	XLC-00088	Cache pits	
Lake Clark	XLC-00083	Village	6
Lake Clark	XLC-00097	Village, 1 house	
Lake Clark	XLC-00098	Village	5
Lake Clark	XLC-00003	Cache pits	
Lake Clark	XLC-00004	Cache pits	
Lake Clark	XLC-00008	Village	4
Lake Clark	XLC-00250	Cache pit	
Lake Clark	XLC-00133	Village	3
Lake Clark	XLC-00134	Village	1
Lake Clark	ILI-00087	Cache pits	
Lake Clark	XLC-00096	Village	1
Lake Clark	XLC-00249	Cache pits	
Lake Clark	XLC-00107	Village	1
Mulchatna River	DIL-00150	Cache pits	
Iliamna Lake	ILI-00031	Village	5

B. History and Culture of the Yup'ik Area

1. Voices of the People

We want to give to our children the fish, and we want to keep the water clean for them....It was a gift to us from our ancestors, which will then be given to our children. F-69, 9/18/11

When I was a little girl they had no Snowgo's [snowmachines], they had no Hondas [Four-wheeler all-terrain vehicles]. We live up river and they fished all the time. In wintertime they fished under the ice. They travel with dog teams. My Dad would take me out ice fishing. I used to be scared of those pikes. I don't know how old I was. That's the only thing they do is try to catch fish, summer time nets, and winter time they do ice fishing. That's how they pass it on down. They subsistence fish, usually they travel with dog teams, that's what they did, and that's how come those people were healthy. They walked, and walked, they worked from morning until they go to bed. That's how come they were healthy. They eat their fish, they go get wood with the dog team, they hunt with their dog teams, and they travel to village with their dog team. People walk and they eat that fish. That's what makes them live long and healthy, I noticed that. F-23, 5/18/11

All we have is use the salmon, salmon all the time. The old people tell us you guys have only one salmon season you guys got to catch it. If you don't catch it you won't have much in the winter, long winter. F-41, 8/19/11

When you look at the map and where the old villages were they were there because of the salmon. You go to Igiagig and Paluk, and Port Tide (?), Levelok, South Levelok and Dillingham... all those villages. Site selection of those communities was very important and it was because of the production of subsistence foods at each of those sites processed. Most of those produced salmon in addition to [other foods], for example you go to the village of Manokotuk, and it is rich in berries. If you go to the upriver villages they are rich in caribou and moose and other resources. Each village was selected by the folks...because of their subsistence resources. M-61, 9/16/11

My father along with other people were very active in fisheries politics. Bristol Bay used to be controlled by Brindle which was a big cannery superintendent and what he said was law of the land. Fish and game used to listen to those big processors. One time my dad was talking to a group Truman Amberg, Joe McGill, Joe Clark from Clark's Point, saying we got to go on strike this year. I think it was Joe McGill said we're not going to get any more money [father's name]. Why are we going on strike? You know we are just going to end up sitting on the beach. Dad says we got to let the fish pass. What that meant was we needed more fish up the river spawning so we would have better seasons later. Then a group of locals said okay we're going to strike but don't tell the processors we aren't striking for more money. Tell them we want more money we know they're not going to give it but we will get more fish up the river because the Japanese decimated our runs in Bristol Bay in the '60's and 70's. We had to build our runs back up, M-60, 9/16/11

Like before, you know a lot of people used to put up a lot of fish 3000, 4000, 5000 fish. They used to have a lot of dogs while they were living that is how they try the tradition they have. They used to hook up their dogs and go wherever they wanted to go. They used to put up a lot of fish to eat. When they get moldy they just wipe it off and eat them. That is the way it was in my living days. Nowadays people when it is moldy they throw them away, that is the way of life now. You can't do that anymore. M-49, 8/20/11

2. Introduction

Perhaps as a result of the relatively recent occurrence of contact with non-Natives, the Yup'ik have retained their traditional culture and language, ecological knowledge and practices, social systems, and spirituality, to as great or a greater degree than any other Alaska Native populations. Where they have adopted non-Yup'ik traditions, such as Russian Orthodoxy, they have blended their own practices and beliefs with the introduced practices to create a new belief system that retains the Yup'ik culture as a whole.

3. Pre-Contact Culture

An Eskimo-speaking people have been living in the region for at least 4,000 years as a recognizable salmon culture, at least as far back as the Norton tradition and Arctic Small Tool tradition.

The Yup'ik of the Nushagak, Kvichak and lower Mulchatna Rivers historically were organized in bilateral extended families of up to about thirty people, settled in permanent and semi-permanent villages. Many of the villages contain a *kashgee*, or men's house, and are relatively small, averaging five to six houses per village in the 12 pre-contact villages for which there is house data (see Table 5). Historic Yup'ik village sites, of which 21 are currently documented, average between 8- 9 houses per village. Today there are only four or five modern Yup'ik villages along the Nushagak River (Dillingham, Ekwok, Koliganek, New Stuyahok, and possibly Portage Creek; see Table 1) and, except for seasonally occupied Portage Creek, they are much larger in population than their historic or pre-contact counterparts.

The wetland landscape is not easy to traverse, except by river, or in the depths of winter when all is frozen. The abundance of fish and game in the Bristol Bay region allowed the Yup'ik

to stay within a relatively fixed range, although they moved throughout their range seasonally from a base village, to hunt, gather, and participate in summer fish camps. The extended families practiced food sharing and generalized reciprocity, both within and between families. Most larger villages functioned as independent and self-sufficient social units, and people married within the village or nearby villages. Sometimes fluctuations in game or fish availability caused groups or individuals to travel from one region to another. Large disruptions to the population did not occur until epidemic diseases arrived with European explorers. These diseases devastated whole populations, decimated villages, undercut social distinctions, and wiped away some of the boundaries over which the earlier bow and arrow wars had been fought (Fienup-Riordan, 1994). These population changes resulted in shifts in salmon harvesting, when population remnants regrouped by joining other villages.

Historically, including after contact, in the winter villages the men and boys older than seven or eight lived in the *qasgiq*, the large communal men's houses, while women and girls lived in smaller house called an *ena*, both built from sod and driftwood. During the winter, the community came together for dances and storytelling, but otherwise, men and women kept in their separate groups and worked to do gender-specific chores. Men, for example, repaired the tools for hunting, while women sewed clothes as well as waterproof raingear to protect everyone from harsh weather.

In the summer, everyone participated in harvesting salmon, whether net fishing, or processing the fish in fish camps. Women dominated the work of processing in the fish camps. Family groups might put up as much as 5,000 fish (Lena Andree, pers. comm., July, 2011), including fish for their dogs.

The Yup'ik traveled to different subsistence sites either overland, by foot or dogsled, or on the water, in vessels that ranged from small kayaks to larger wooden boats. Traditional festivals during the year included the Bladder Festival, *nakaciuryaraq*, the Messenger Feast, *kevgiryaraq*, and the Seal Party, *uqiquryaraq*. Food exchanges played an important part in these festivals described below.

4. Post-Contact History and Culture (A.D. 1791 to 1935)

At the turn of the century, the bilateral extended family, stretching over several generations, still formed the basis of Yup'ik villages. "An overlapping network of consanguineous and affinal ties, both fictive and real, joined the extended families, making up a single community," (Fienup-Riordan, 1994). Winter villages could be just one family, but ranged up to 150 to 300 people in some places. Families did not all live together in one house; the winter villages had one or more *qasgiq*, or communal men's houses, where men and boys over age 6 or 7 lived and worked together, telling stories, making tools, and preparing for subsistence activities. In the *ena*, women, girls, and the youngest boys lived in groups of up to a dozen, and the women taught the girls how to sew and cook. They cooked the meals there, either in the entryway, or in a central fireplace. Each winter, for three to six weeks, boys and girls would switch homes, and the men would teach girls survival and hunting skills, while the women would teach the boys how to sew and cook (Fienup-Riordan, 1990).

The *qasgiq* also functioned as the communal sweat bath for the men. They would open the central smoke hole, feed the fire until the heat was intense (possibly up to 300 degrees), then bathe. Men sat in the sweat house in the order of their social status. The *nukalpiaq*, or good provider, held a high social position and contributed wood for the communal sweat bath, as well

as oil to keep the lamps lit; he also played an important role in midwinter ceremonial distributions of food (Fienup-Riordan, 1994). There was competition between families to be the best providers.

Contact between the Yup'ik of the Bristol Bay area and Russians or Americans was later and more limited than in the rest of Alaska. The region was perceived to have few resources worth exploiting, and the marshlands were difficult to traverse. While some Russian explorers, traders, and missionaries persisted and made repeated contact with the Yup'ik throughout the nineteenth century, they did not settle in the area in any numbers until the twentieth century (VanStone 1967). As a result, the Yup'ik of this region, perhaps more than any other indigenous peoples in Alaska, have retained much of their language and cultural traditions to the present time.

When the Europeans came, they brought diseases, to which the Yup'iks and other Native populations had no immunity. The first epidemic known to have occurred in the Nushagak River region was before 1832, but there are no records of the number of dead. The 1838-1839 smallpox epidemic caused several hundred deaths in the Nushagak region and also occurred in the Dena'ina territory. Vaccines were introduced in 1838, and some Yup'ik received them, probably reducing the scope of the epidemic. But each year, while not necessarily counted as an epidemic period, brought more death and illness to the region. Survivors were often weakened and succumbed later to other illnesses. VanStone states that during this period "The specter of ill health and death was continually present among the Eskimo population of all southwestern Alaska" (VanStone, 1967, p. 100). The loss of population (especially elders), the disruption of families, the plethora of orphans, and subsequent rearrangements of the social order created a

social and cultural upheaval that the Yup'ik struggled to overcome. The European visitors and settlers may not have understood that what they observed was not the way the Yup'ik had lived even a few short years before.

It is not certain when the first Russian visit to the Nushagak and Kvichak region occurred, but in 1791 Dmitri Ivanovich Bocharov, under orders from the Russian-American Company, began to explore the area. Bocharov may have reached Iliamna Lake and the Nushagak River (Henry 1967). "During the struggles between the Shelikov and Lebedev-Lastochkin companies for control of the Cook Inlet area, members of the latter in 1792 plundered Iliamna and Nushagak villages that Bocharov had befriended" (VanStone, 1967, p.4). During this early period the region was not well known to outsiders, but the Russian-American company sent an expedition in 1818 to explore the territory north of Bristol Bay. In the same year, the company established a post at the mouth of the Nushagak River, the Alexandrovski Redoubt. Feodor Kolmakov, of mixed Russian and Native American ancestry, was in charge; he established trade relations with the Yup'ik and baptized some of them, spreading the influence of the Russian-American Company in several ways (VanStone, 1967, p. 9).

In the summer of 1829, two minor Russian visits had major consequences for the Yup'ik. Ivan Filippovich Vasiliev led an overland expedition to ascend the Nushagak River, and the priest, Ivan Veniaminov, visited the Redoubt. Veniaminov took away a permanent interest in the Bristol Bay region and in the Nushagak station, which carried over even into his later position as Bishop. Vasiliev's exploration, in turn, made the pathways to entering the region clear for all subsequent Europeans. VanStone states, "The exploration of Bristol Bay and the lower Nushagak River, together with the founding of Alexandrovski Redoubt, later called Nushagak by Anglo-

Americans, played a vital role in opening up the interior regions of southwestern Alaska to the fur trade” (VanStone, 1967:11). Though the Redoubt’s importance for the fur trade lasted only 25 years, its presence offered a gateway to the region. It also opened up the region to missionary activity and to later mining exploration. It proved to be a turning point for the Yup’ik.

Christianity was introduced in 1818, at the time that Alexandrovski Redoubt was built, but it was not until Veniaminov’s arrival in 1829 that extensive missionary activity took off. Veniaminov was flexible in his approach to the Yup’ik and religion, and numerous conversions were registered in church documents. He “noted that ‘the Nushagak River was for them the River Jordan’” (Barsukov, 1887-1888, vol. 2:37). In 1832 Veniaminov visited again and allowed the building of a small chapel. In 1838 his local successor, Gregory Golovin, visited, administered sacraments, and baptized an additional 52 people. By 1842 there were about 200 converts at Nushagak, and in 1844 Bishop Veniaminov issued orders for the construction of a new church. The church, by 1879, was close to 2,400 members. Its success among the Yup’ik may have had much to do with the flexibility of Veniaminov’s approach toward them. Yup’ik were not required to fast, and “Ancient customs, as long as they are not contrary to Christianity, need not be too abruptly disturbed....” (VanStone, 1967:31).

Fur trading accompanied exploration, and sometimes incited it. By the 1840’s contacts between the Kolmakovski Redoubt, on the Kuskokwim, and Alexandrovski at Bristol Bay were frequent. The company managers of the fur trade created *toyons*, designated local community leaders, and rewarded them with silver “United Russia” medals and incentive gifts. These *toyons*, motivated by their new prestige and the material rewards offered, then encouraged the members of their social networks to trap more furs for the Russians (Van Stone, 1967). The process of

using village providers to convert the population into loyal company men and women to recruit fellow villagers into exploiting and extracting the resources of their own region for external benefit in a colonialist economic system has not changed in over a hundred years. The researchers observe the practice has helped to dismantle the traditional ecological knowledge and practices gained from the long indigenous history of subsistence-based culture. VanStone (1967:56) writes: “The more closely the Eskimos were bound to the Company, and the more heavily they relied upon the trader for supplies and items of European manufacture, the less likely they were to pursue traditional subsistence activities.”

Trade items included wool blankets, tobacco, beads, tent cloth, cast iron kettles, knives, iron spears, steel for striking a fire, needles, combs, pipes, etc. (VanStone, 1967:56). While these items did not immediately alter the deeper structures of the culture, the desire for them acted as a change agent among the population. Where before, access to status had been open to all, through skills and responsible sharing with others, access to the time and materials for trapping, open to fewer individuals, had the potential to change the social dynamics of the Yup’ik. The companies allowed the Alaska Natives to purchase some items on credit; as debt mounted, some would be unable to repay for years.

The powerful Alaska Commercial Company post at Nushagak maintained “a moderately flourishing trade with people of the area, at least through the remainder of the nineteenth century” (VanStone, 1967:56), engaging in about \$10,000 in fur trades annually.

Mining brought other people from outside the region, but, in the nineteenth century, was economically unimportant compared to other activities. In 1887-1888 the prospectors Percy Walker, Henry Melish, and Al King placer-mined for gold in the Kaktuli and Nushagak Rivers,

and there was also placer mining along the Mulchatna. In 1909 a group organized the Mulchatna mining district and formed the Mulchatna Development Company in Seattle (VanStone, 1967:83). Their activities were confined to the upper Mulchatna River, and there was only a very temporary influence of miners on the local Yup'ik population. One elder (New Stuyahok Interviewee) told the story of his grandfather, who showed him gold and told him that if he found rocks with gold in them to throw them away, because they were bad. The grandson thought it was because it would cause social disruption by bringing strangers to the area who would disrupt the land and the culture of the people. The elder said he had thrown a big chunk of gold away once, but he thinks he still knows where it is. The experience of the Yup'ik people with larger mining corporations has been minimal. Fish have been far more important both to subsistence and cash-based economies.

By the end of the nineteenth century, Bristol Bay had become an important commercial salmon fishing zone. "The first cannery in Bristol Bay was built in 1883 at the Yup'ik Eskimo village of Kanulik on the Nushagak River . . . it began its operation in 1884 as the Arctic Packing Company" (Troll, 2011:3). The fourth cannery built, at Clark's Point in 1888, is now the oldest surviving cannery in the region (Troll, 2011:4). The commercial fishermen in Bristol Bay used wooden sailboats for drift gillnet fishing for sockeye salmon and were mostly Italians, Scandinavians, and Finns, hired at Seattle and San Francisco (Troll, 2011:10), although some Yup'ik also fished commercially, including Lena Andree, now an elder from Dillingham who fished on one of the wooden sailboats with her father in the mid-1930s. When World War II began and kept many of the European fishermen from coming to Alaska to fish, the canneries

“discovered that the Native Aleuts and Eskimos were marvelous boatmen and seemed to have been born to sail,” according to Al Andree (Troll, 2011:35).

The U.S. Bureau of Fisheries visited the Wood River lakes and Nushagak and Nuyakuk Rivers, and, in 1935, the U.S. Geological Survey conducted the first survey of the region and produced what would become, for decades, the standard reference for people not from the region. For the Yup'ik, the elders continued to convey their traditional knowledge of their homeland, as they had for thousands of years (Van Stone, 1967). A crevasse of deepening proportions opened between two contrasting interpretations of the landscape, that of the outsiders, who saw the region as a land of resources to be exploited, and that of the indigenous peoples, who saw the region as the sacred landscape of home, and whose culture and way of life depended upon it.

C. History and Culture of the Dena'ina

1. Voices of the People

We harvest [subsistence foods] three times for that one person: day of the burial, forty days later, and then one year later. It is really significant, just for that one person who passed away; we harvest from the land three times to honor and to pay our respects to ones who lost their family member. That has been going on for over 10,000 years. M-33, 8-18-11

...from our ancestors, that is how we get all of our information to have fish. The way we put it; the way we store it for us to eat. That is where we learned it. It is passed on from generation to generation to have fresh fish. F-48, 8/20/11

I always think that we are very, very, very lucky people. I know where I came from. I know who I am. I know where I belong in this world. I know where my ancestors come from. I know the trips; the walking, the hiking, I know the history of where they were. Every time I come into this part of the country or fly over it, when I first see the Lake Clark area or coming from the south and see Sixmile Lake, I know I'm home! F-32, 8/18/11

So the importance of this resource, specifically salmon, has a major impact on my people here. That's the reason why we live here. We have sockeye salmon until March, when everywhere else has no more. That's why my ancestors fought over this region... The reason why they've been here for so long is it's a healthy environment, and we have been kind of watching over it all these years. My ancestors fought over it, and they won every battle. We beat the Russians two times. It was musket against bow and arrow. So, you see, the importance of it has a really long history of why it is like it is now. We took care of it. Not only that, we have shared with everybody in the whole world. M-33, 8/18/11

My Auntie [name] would say, "Don't forget how to live off the land" and I'd think, "Oh, we could just go to the store and have microwave stuff." She said, "One day in this world something's going to happen where you guys are going to rely on living off the land, trapping off the land." Like we take things for granted now; we can go on an airplane and shoot a moose or trap beaver or trap squirrels up on the mountain. We have to. We can't just forget our ways; how to live off the land, because one day there's going to be something that happens in the world, where we are going to have to learn to survive out here. F-32, 8/18/11

But what the spiritual aspect of what they believed was strong...they had energy. Energy from what they worshipped; everything living. M-33, 8/18/11

That is spring water [at Kijik]. It does not freeze. That is why you can go over there and get a sockeye salmon in March; it might have a green head, and it's red, but it's still a sockeye salmon. You can go over there on New Year's Day and get a fresh sockeye salmon. F-33, 8/18/11

2. Pre-Contact Culture

Dena'ina origins are described in the section on Prehistory (II.C.2) and indicate the Dena'ina have been operating as a culture for whom salmon is the primary resource since A.D. 1000. Much can be inferred about the pre-contact Dena'ina culture because of Cornelius Osgood's (1976, originally published in 1934) comprehensive *Ethnography of the Tanaina* [sic]. The Dena'ina pre-contact cultures were sustainable and egalitarian in terms of equitable access to resources. The fundamental food source was salmon, but also included caribou, moose, bear, beaver, and other mammals and birds (Osgood, 1976:26) and about 150 edible plants (P. Kari, 1987:60-188). For the pre-contact Dena'ina salmon were caught in a number of ways, but primarily in weirs made of poles sunk into the bottom of a stream and strung with a lattice-like thatch, allowing water to pass through, but trapping migrating fish (Osgood, 1976:28). When they weren't fishing they simply opened a gate, and the fish swam through to spawn upstream. To solve the problem of storing this food resource for later use, the Dena'ina devised a simple but effective underground cold storage pit (Osgood, 1976:42). Two layers of birch bark, with moss in between, lined the pit, which was filled with dried fish, layered with grass, during fall freeze-up. The frozen fish were eaten throughout the winter and spring, until the next summer's salmon run. Like modern fish camps, traditional Dena'ina fishing was an extended family operation. Everyone worked for, and received the benefits of, the clan-based family group.

Because of the stable salmon food resource and a means to preserve it, the Dena'ina lived in sedentary or semi-sedentary villages of substantial log houses, usually spread out along a ridge above a lake, a river side channel or a tributary to one of the major rivers (Osgood, 1976:55-62). The married men of a village were members of the same matrilineal clan and their wives and children were members of a different clan (Osgood, 1976:128-131). Within this family group, connected by blood and marriage, and allied for economic purposes, various individuals performed different assigned tasks. The Dena'ina called this group the *nakilaqa* (*ukilqa* in Osgood) (Osgood, 1976:134) or clan helpers. The clan helpers recognized a chief, called a *qeshqa*; in the Iliamna area the position was related to being a family head (Osgood, 1976:131-3; Fall 1987)). The *qeshqa* had numerous characteristics, among them wisdom, experience, and generosity. He or she had three primary duties: first, to arbitrate and resolve disputes; second, to care for the elderly and orphaned; and third, to assure the survival of the clan helpers through the equitable distribution of food. Regarding the latter, the *qeshqa* controlled the foods gathered, processed, and stored by the clan helpers and had authority to redistribute the food (mainly salmon) back to people throughout the winter on an as-needed basis.

This system provided a safety net. Each *qeshqa* had a partner in a distant village, called a *slocin*. If one village ran low of food, the *qeshqa* could request aid from his partner, who would divert some of his village's food resources to the needy village. The second *qeshqa* would be willing to do this because, at some point, his village might be short of food, and the partner he helped would return the favor.

3. Post-contact History and Culture

In the study area Dena'ina territory includes the Kvichak drainage of Lake Clark, the Newhalen River and the west half of Lake Iliamna. Today, the Dena'ina villages in the Kvichak/Iliamna drainage are Nondalton, Iliamna, and Pedro Bay; Kokhanok is mixed Dena'ina Alutiiq, and Yup'ik. This brief history is germane to the project because it establishes 1) the Dena'ina repelled Russian colonization maintaining population superiority in their homeland to this day, 2) adopted Russian Orthodoxy which ritually incorporated traditional viewpoints of a symbolic relationship of people to the land, and, 3) documents the start of the economic ties to the Bristol Bay salmon canning industry. Through it all the people retained a strong subsistence lifestyle.

During the late eighteenth century, two Russian trading companies, the Shelikhov Company and the Lebedev Company, occupied Dena'ina territory, focusing primarily on the Cook Inlet region but extending into Iliamna Lake. The Lebedev established a post at Pedro Bay, on Iliamna Lake, in the 1790s (Ellana and Balluta, 1992:61). About 200 Russians occupied Cook Inlet and the Iliamna Lake area during the late eighteenth century; by the turn of the century, their presence had shrunk to a small handful through a complex series of events involving attacks and counter-attacks as outlined by Boraas and Leggett (in press, 2012). As a result of hostilities the Russian Lebedev Company left Alaska in the spring of 1798, and subsequent Russian presence in Dena'ina territory was minimal.

In 1838 a terrible smallpox epidemic decimated the Dena'ina (and most other Pacific coastal Alaska Natives); Where there are statistics such as the Kenai River drainage about half the overall population died in two years (Federova 1973:164) and, although there are no specific statistics for the Lake Clark and Iliamna, it is likely the situation was tragically similar in the

study area, Traditional shamanic practices were ineffective against smallpox (and, after 1840, many Dena'ina were baptized as Russian Orthodox, (Townsend 1981:634-6), accepting the church's explanation for the epidemic as "God's will" (Boraas and Leggett in press, 2012). In 1853 the Orthodox Church undertook an inoculation program, vaccinating baptized Dena'ina against smallpox, and an Orthodox Church was built at Kijik in 1884 (Ellana and Balluta, 1992:63). It is probable that by the early twentieth century, most Dena'ina in the Iliamna/Lake Clark area were baptized as Orthodox.

As summarized by Karen Gaul (2007:48) salmon canning in Bristol Bay emerged as a major industry in the late 1800s. Unregulated Bristol Bay canneries regularly blocked the mouth of the Kvichak and Nushagak Rivers to harvest salmon; consequently, there were years when there was little escapement into the rivers, creating extreme hardship for the upriver Dena'ina and Yup'ik subsistence communities. Starting in the early 1900s, men from the inland villages traveled to the coast to work seasonally in the commercial fishery, as many still do today. The fur trade was a second non-subsistence occupation, providing cash for food, guns and ammunition, traps, cloth, and other items, but commercial salmon fishing remained the primary source of money for most indigenous families and supplemented subsistence activities (Gaul 2007:48).

Well into the twentieth century Dena'ina practiced a ritual that involved sending the spirit of the animal to the "reincarnation place." Land animal bones were burned in the fire and water animal bones, like salmon, were returned to the water. These practices ritualized ecology and were said to bring the animal back to be hunted or fished again (Boraas and Peter 1996).

Archaeological evidence indicates the Dena'ina were burning bones in their fire hearths (Boraas and Peter 2008)

D. Traditional Yup'ik and Dena'ina Spirituality and Cosmology

Many modern practices of Yup'ik and Dena'ina have their basis in traditional spiritual and cosmological beliefs, though they are sometimes re-contextualized in Christianity. This section discusses the traditional spiritual and cosmologic beliefs and practices of both peoples

1. The Yup'ik People

Traditional Yup'ik values revolved around not only their extended families, but also their relationships with the wild animals and other components of the natural landscape. Within this belief system, the *Ellam yua*, or creative force, was a universal cosmic presence who coordinated existence and established a basic ordering framework; *tunghit* were powerful spiritual beings who controlled the recycling of different animals, fish, and bird forms (Langdon, 2002).

The Yup'ik have traditionally regarded animals as other peoples, or categories of kinsmen, with whom they have fluid relations that often cross species and interpersonal boundaries. There are numerous stories of half-animal, half-human beings who live in the villages or of people turning into seals, birds, fish, or other animals, and then turning back into humans, as well as stories of people who seem to be human, but turn out to be seals or other animals in a temporary human form. Several major traditional festivals and ceremonies, described below, honored this relationship. The spiritual values associated with each of these festivals emphasized sharing between humans and respect and care for animals. Traditional stories and advice speak of the animals giving themselves to the humans when the humans need them for food. The good practices of sharing, care, and respect (e.g., being careful with the animal's body and soul, and not wasting the food) ensured the animals' continued willingness to give themselves to the

hunters and fishermen in the future. Sharing of the products of subsistence with their human kin and other relations also strengthened the bonds of family and community. The First Salmon celebration in the river communities, when those who have caught the first king salmon in the spring share them with elders, and all those in need, as well as with friends and family, emphasizes these values.

The Yup'ik relations with the wild animals and fish of their landscape were primary, and in many ways still are. The Yup'ik related to the fish, the bear, the caribou, the moose, the ravens as relations, others equally inhabiting the landscape with them as interrelated peoples. During spring, summer, and fall the Yup'ik hunt and fish the animals as food, but when processing the animals as food they treat them with respect and care, and enable their return through rituals and ceremonies. In winter, a period of rest and renewal for the human population, in the past the Yup'ik attended to the renewal of life through the rebirth of the animals they had hunted, and fished, in, according to Fineup-Riordan five ceremonies, "three of which focused on the creative reformation of the relationship between the human community and the spirit world on which they relied." Finenup-Riordan 1994:267). Today, many of the Russian Orthodox ceremonies continue to be based on this ancient calendar of propitiation of the world of the spirit, in all seasons. *Ellam yua* was a universal cosmic presence who coordinated existence and established a basic ordering framework; *tunghit* were powerful spiritual beings who controlled the recycling of different animals, fish, and bird forms (Langdon 2002). During the winter ceremonial season, the men beat the circular drum—traditionally made from stretching seal gut on a wooden frame—for songs and dances. The drum beats represented the heartbeat of *Ellam yua*. Thus, the celebrations were spiritual in the deepest sense. They were also material, involving the exchange and sharing

of wild subsistence foods from both animals who had given themselves willingly to the hunters and plants gathered from the landscape, considered to be spiritually alive.

During the Bladder Festival, at or around the Winter Solstice, the women brought out the bladders of seals, which they had been saving since their husbands brought the seals to them to prepare, because the Yup'ik believe that the souls or essence of animals are located or retreat to their bladders when they are killed. By saving the seal bladders and returning them to the sea, the Yup'ik enable the seals to be reborn, and present themselves again as food for the Yup'ik when needed. The women take the seal bladders to the *qasgiq*, or men's house, where the men inflate them and keep them for about ten days, while they go through a series of rituals to honor the seals and share food in the community, before returning the bladders under the ice, to the sea, enabling the seals to be reborn and to present themselves to the Yup'ik when needed again as food. The men would compose new songs for the Bladder Festival, including songs about salmon, and sing continuously in the *qasgiq*; people believed that "the singing in the lighted *qasgiq* commanded the attention of the spirits of the animals" (Fienup-Riordan, 1994:284).

At *Qaariitaaq*, at the beginning of the Bladder Festival, the young boys were painted to represent the spirits of the dead, and went visiting, going around to the different houses to collect special food treats. Every house was brightly lit, and the hostesses wore their best clothes. The boys held out their hand-carved bowls, and the women handed out the special snacks. On the fifth night of these celebrations, the boys, and men, came to fully embody the spirits of the dead, and the fifth night was considered the arrival of the spirits. (Fienup-Riordan 1994: 271). At *Aaniq*, held directly after *Qaariitaaq*, two men dressed in gut skin parkas, are referred to as mothers, the "*aanak*", and they are taken around to collect newly made bowls filled with

akuutaq, traditionally a mixture of fat and berries. Small girls and boys referred to as their “dogs” would accompany them.

*The way that people do things
And the way of helping others
And the way of creating friendship
The Bladder Festival is like an opening for these things to occur
And through those events
The people being scattered
Through that too they are gathered
(Toksook Bay Eders, November 3, 1983 NI57 IN Fienup-Riordan, 1994: 267).*

Today, starting during the Russian Christmas season follows this familiar pattern – groups go visiting from house to house, and receive special foods.

Other important ceremonies include the Great Feast for the Dead, *Elriq*, held every ten years, as well as the annual feast for the dead, and *Kelek*, a festival that included both serious and comic masked dances, when “animal spirits and shamanic spirit helpers made themselves visible in the human world in dramatic form” (Fienup Riordan, 1994:316). *Kelek* was performed to influence the animal spirits and elicit successful hunting and fishing through the return of the animals the following year.

Two other winter festivals underscored the redistribution of goods, including subsistence foods. The first, *Kevgiq*, the Messenger Feast, was a celebration and display of the bounty of the harvest, in which villages challenged each other to exchanges of wealth, with demands for specific items that were difficult to provide, such as certain game meat in a year when that game animal was scarce. *Kevgiq* served to reduce tensions between villages through sharing and friendly competition. It also provided food security by strengthening ties between villages and encouraging exchange relationships that could help people in times of food shortages. Sharing

was considered to be a behavior that would be rewarded by the return of the animals to those hunters and fishers the following year. *Petugtaq*, the Asking Festival, was a challenge to exchange gifts of value between cross-cousins and others, where the person whose gifts were the most valuable gained the highest prestige. Cross-cousins were in “joking cousin” relations with each other, and were able to call each other out on bad behavior, embarrassing each other without repercussions, since they were not permitted to get angry with each other (Fienup-Riordan, 1994:330). The behaviors were thus made public and frequently resolved through this tension-reducing mechanism. Both festivals involved teasing, dancing and singing as part of the ritual celebration of the exchanges. All of the traditional festivals required subsistence foods, not only for sustenance, but also for the meaningful symbolic and material exchanges.

During their ceremonies, the Yup’ik wore masks they had carved, often representing animals or those in transition between the animal world and the human world, the half-animal, half-human. These masks symbolized both the high regard of the Yup’ik for the animals and the importance of their roles in Yup’ik culture. For the Yup’ik, the masks were *agayuliyararput*, or “our way of making prayer” (Fienup-Riordan, 1996:xviii).

Dances, including *ingulag*—the women’s loon courtship dance—and other bird dances, filled the evenings and contributed to the festivities. Each dance told a story and many featured the animals with whom the Yup’ik partnered in their negotiation for existence in the challenging landscape. Dances were traditionally an essential part of the culture and celebrations and have returned in force as part of cultural revitalization along the Nushagak and elsewhere. Fienup-Riordan (1994:288) quotes Billy Lincoln:

And at night, every night, they have what is called *nayangaq*. They dance. These young people who are sitting against the far wall go down in front of them and

dance, sitting down pretending to be some animal, so thus, the(?) *nayangaq*. They imitate a certain animal. When the time came whatever animal he is pretending to be he imitates its noise. They imitate all kinds of animals – loon, hawk, raven, arctic fox. They make noise accordingly. They dance pretending to be some animal (July 10, 1985).

The dancers represented the many ways the stories and lives of the animals were woven into their own, in the richness of shared existence in the watersheds of southwest Alaska:

These dance motions were more than the mere imitation of the motions of the animals. When the performers danced during *Kelek*, they actually performed the animals' dances. Just as married women danced the loon's mating dance during *Ingulaq*, so the performers during *Kelek* danced the dances of the animals whose presence they hoped to elicit in the year to come. . .

Hawkes (1913) quotes a Unalakleet chief in an eloquent estimation of the value of these dances within Yup'ik culture: "To stop the Eskimo singing and dancing," he said, "was like cutting the tongue out of a bird" (Hawkes cited in Fienup-Riordan, 1994:320-321).

Fienup-Riordan (1994:355) summarizes how the Yup'ik traditionally saw themselves in relation to the universe: "Yup'ik cosmology is a perpetual cycling between birth and rebirth, humans and animals, and the living and the dead. Their relationship between humans and animals reflects a cycle of reciprocity in which animals give their bodies in exchange for careful treatment and respect."

2. The Dena'ina People

The traditional Dena'ina spiritual world revolved around a quest for *k'ech eltani*, or "true belief," as a way to understand and interact with the natural world (Boraas and Peter, 1996:183-4). The Dena'ina believed that social and ecological harmony was affected by an individual's attitudes, actions, and even thoughts toward other Dena'ina and to nature. To maintain harmony,

the Dena'ina sought true belief, a kind of mind-set expressed through hunting practices, cooking rituals, communication with animals and plants (prayer), and other practices that demonstrated having a "good attitude" toward the forces of nature. Kalifornsky (1991:13) writes that, "Whatever is on earth is a person [has a spirit] they used to say. And they said they prayed to everything. That is the way they lived." Achieving *k'ech eltani* involved a spiritually torturous and mentally rigorous quest for understanding (Boraas and Peter, 1996:187).

Many of the Dena'ina traditional stories (*sukdu*) describe the dire consequences of having a bad attitude by not practicing the prescribed rituals such as burning the bones of consumed animals or distributing fish bones in the water as means to symbolically assure the animals would come back (Boraas and Peter, 2008:222-223). In these stories, a bad attitude would have the consequence of the animals, believed to be both sensate and willful, withdrawing and not offering themselves to be taken for food. The result would be starvation. A bad attitude could result in social turmoil or mental illness. There was immense pressure to behave and think respectfully toward the natural world including salmon.

In a forthcoming chapter on Dena'ina world view, Boraas (in press) writes the following about traditional attitudes toward animals:

Attitudes toward bears typify attitudes toward animals. In "Three People in Search of Truth," (Kalifornsky 1991:164-167) three brothers hunt a brown bear, the most feared and respected animal. The first fails because he is poorly skilled; the second fails because he is impetuous, and the third succeeds because he is skilled, controlled and speaks the correct words to the bear, which then respects him and does not resist being killed. In Kenai a successful hunter used the phrase *Chadaka, k'usht'a nhu'izdeyeshdle*, which translates as "Great Old Man, I am not equal to you," to communicate humility toward the bear he was hunting (Kalifornsky 1991:167). In 1966 Mrs. Mike Delkettie, a Nondalton Dena'ina, reported that a similar saying was used in that area; moreover, the eyes of the bear were buried near the spot where it was killed as an offering showing proper

respect (Rooth 1971:62). Francis Wilson, also from Nondalton, told Rooth (1971:50) that, after a bear was killed, they had to follow prescribed procedures, particularly in the treatment of the head, lest they never kill another bear, because “the bear still knows what is happening, so they have to be very careful with what they are doing”. Hunting rituals and prayers were meant to thank an animal for allowing itself to be killed and sometimes it also involved giving an offering as a measure of the importance of proper attitude (Rooth 1971:50).

The First Salmon Ceremony (Osgood, 1976:148; Kari and Fall 2003:184-190) expresses the intimate relationship of Dena’ina and salmon. As the Osgood’s retelling goes, a *qeshqa*’s (chief’s) daughter was admonished not to go near the fish weir. The determined girl went anyway to find out what was in the trap, promising to return later. At the fish trap she saw a king salmon, began talking to him, and gradually transformed into a salmon and disappeared with him. The desperate *qeshqa* looked for his daughter to no avail. Years later, the *qeshqa* was collecting fish from the weir. He put them on the grass and took them to be cleaned, but forgot one little one. He returned to find a little boy sitting there. He walked around the boy three times and realized it was his grandson. The boy then told his grandfather the things that should be done to ensure the salmon return each year, and those things became the First Salmon Ceremony, a world renewal ceremony³ which ritually recognized the salmon’s return and the Dena’ina as salmon people.

Some places took on special importance The Giants Rock was along an old Dena’ina trail that became the Pile Bay Road between Old Iliamna and Kamishak Bay on Cook Inlet, one of the major trails connecting eastern and western Dena’ina territory. The rock was the site of a

³ World renewal ceremonies are important identity-building ceremonies that recognize the beginning or end of a year’s subsistence activity and social cohesion. In American culture Thanksgiving is a world renewal ceremony.

mythological story and was a spiritual place (Johnson, 2004:49-54). The rock was dynamited in 1955 as part of road building activities by the Territory of Alaska; Dena'ina still regularly leave votive gifts at the site in homage to the place and the mythological event that happened there. The Pile Bay Road has been proposed for expansion as part of proposed mining resource development. Other sacred rocks and sacred locations exist in Dena'ina territory, but for most their location is privileged cultural information (see Boraas, 2009:10-20).

E. The Yup'ik and Dena'ina Languages: Salmon and Streams

1. Voices of the People

Talk Native, no English....They talk Native [Yup'ik] better [than English]. M-25, 5/18/11

That's why we quit using our native tongue because we get our...ears pulled. I don't know how many times I sit in the corner because I use my native tongue. We couldn't speak our own language in school because we get abused. F-46, 8/20/11

2. Introduction

Language is intimately tied to cultural identity and Yup'ik and Dena'ina have evolved as languages of place for their respective areas over thousands of years. Landscape, subsistence, social relations, and spirituality are reflected in both languages. The variety of words a language has for a given topic generally reflects the importance of that topic to the people who speak it. Given their cultural importance, it is not surprising that both Dena'ina and Yup'ik have numerous terms involving salmon, other fish, and fishing. Streams are also intimately tied to Dena'ina and Yup'ik psyche and their languages reflect that fact.

Table 6 Estimated Number of Central Yup'ik and Dena'ina Speakers. Data from Krauss (2007:408)

Language Family	Language	Population Estimate	Speakers	Percent Speakers
Eskimo-Aleut	Central Yup'ik	25,000	10,400	42%
Athabascan-Eyak-Tlingit	Dena'ina	1,000	50	5%

3. The Central Yup'ik Language

The Yup'ik people of the Nushagak and Kvichak River watersheds are part of the Central Yup'ik group, of whom there is a population of about 25,000 in an area that also includes coastal communities and the lower and middle Kuskokwim River drainage (Krauss, 2007:408) (See Table 7). Ten thousand four hundred of this population, or 42%, speak Central Yup'ik of which the 7,000 mostly Yup'ik of the Nushagak and Kvichak River drainages are a part. Central Yup'ik has one of the highest percentages of speakers among indigenous languages in the U.S and is an indicator of strong cultural heritage. Yup'ik is the first language for many residents in the study area and the language in which many feel most comfortable expressing complex or heartfelt ideas, which is why, for this project, we encouraged interviewees to respond in Yup'ik if they so choose. Eight of fifty-five interviewees spoke in Yup'ik. One Yup'ik interviewee (M-25; 5-18-11) spoke about helping set up a 2011 Elders Conference which occurred a few days before our interviews in New Stuyahok in which the entire discussion was in Yup'ik. He said, "I set up that meeting [Elders Conference], I try to do it for a long time...yes, talk Native [Yup'ik], no English. Get somebody else to translate...they talk Native better [than English]."

Table 6 presents Yup'ik terms for salmon, related fish, and fishing activities. In many cases there are multiple words and/or dialect differences. As indicated the sheer number of words are indicative of a long history with salmon and fishing activities. Moreover, the nuanced meaning of some words is indicative of a deep knowledge of salmon and related activities. For example the word *kiarneq* means "unsalted strip or fillet of fish flesh without skin, cut from along the backbone and hung to dry"

Table 7. Yup'ik Words for Salmon and Other Fish Species and Related Fishing Terms. (x means literal translation same as English term.) From Jacobson (1984)

English Term	Yup'ik Word	Literal Translation
salmon (generic) (<i>Oncorhynchus spp.</i>)	<i>neqaraq</i>	any species of salmon
dog salmon, chum salmon	<i>aluyak</i> <i>iqalluk</i> <i>kangitneq</i> <i>mac'utaq</i> <i>teggmaarrluk</i>	x 'fish' 'old dog salmon after spawning' x boiled half-dried salmon
humpback salmon, pink salmon	<i>amaqaayak</i> <i>amaqsus</i> <i>cuqpeq</i> <i>terteq</i> <i>amaqatak</i> <i>sayalleraam amaqatii</i> <i>neqnirquq</i>	x x x x 'back of fish, hump on back' 'back of spawning red salmon is tasty'
silver salmon, coho salmon	<i>caayuryaq</i> <i>qakiiyaq</i> <i>qavlunaq</i> <i>uqurliq</i>	x x 'streak or wake made on surface by fish'
red salmon, sockeye salmon	<i>cayak</i> <i>sayak</i> <i>sayalleq</i> <i>sayagcurtuq</i> <i>imarnikaralegmun</i>	x x 'he is fishing for red salmon at a deep calm place'
spawning salmon	<i>masseq</i> <i>masruuq una neqa</i> <i>nalayaq</i> <i>nalayarrsuun</i>	'old salmon near spawning' 'this fish is a spawning salmon' x 'fish pear to catch spawning'

	<i>talayaq</i> <i>talmag (NUN)</i> <i>talmagtut</i>	salmon' 'calico salmon' 'to spawn (of fish)' 'they are spawning'
king running under smelt	<i>aciirturtet</i>	'the first group of king salmon running under the smelt'
salmon egg	<i>cilluvak</i>	'salmon egg, especially aged salmon egg'
salmon strip	<i>culunallraq</i> <i>taryitaq</i>	'salted and dried salmon strip'
salted fish or meat	<i>culunaq</i> <i>culunanek ajurciuq</i> <i>sulunaq</i> <i>sulunaneq ingqillruuq</i> <i>taryitaq, taryiraq</i> <i>taryirki sulunarkat</i>	'salted fish or meat that is eaten after it is cut up and soaked to remove excess salt' 'she is soaking some salted fish' see <i>culunaq</i> 'my wife cut up the salted fish' 'salted salmon strip' 'put salt on the pieces of fish to be preserved'
scale (fish)	<i>kapciq</i> <i>qelta</i> <i>akakiik qeltairru suu</i> <i>pirniaraqa</i>	x 'fish scale', 'take the scales off the whitefish so that I can make soup with it!'
rolled oats	<i>qeltengalnguut</i>	'things like fish scales'
smelt	<i>cemerliq</i> <i>cimigliq</i>	x x
stick(n) fish-spreading	<i>ayagta</i> <i>ayagtekartellruunga</i>	'prop, support, <i>especially</i> a small stick used to keep a cut fish open as it dries' 'I gathered material to use as spreaders for drying fish'
stickleback	<i>cukilek</i> <i>angun cukilegneq</i>	'one with quills' 'the man is dipnetting for

	<i>qaluuq</i> <i>ilaqcungaq</i> <i>quarruuk</i>	sticklebacks' x 'needlefish'
supper	<i>atakutaq</i>	'supper, evening meal'
tail, fish	<i>papsalqitaq</i> <i>papsalquq</i>	'dried fish tail' 'tail or caudal fin of fish'
preopercle	<i>ulluvalqin</i>	'gill cover of a fish, preopercle'
fish cheek	<i>ulluvalquq</i>	'cut from the fish'
trap, fish	<i>taluyaq</i>	'fish tray'
whitefish with pointed head	<i>cingikeggliq</i>	x
young whitefish	<i>esevsiar(aq)</i> <i>iituliar(aq)</i>	x 'whitefish fry'
frozen raw whitefish	<i>qassayaaq</i> <i>akakiigem meluanek</i> <i>qassallruunga</i>	'frozen whitefish aged before freezing and served frozen' 'I ate the whitefish eggs raw'
To fish (v)	<i>neqsur</i>	?
Fish	<i>iqalluk</i> <i>ilaqcuugaq</i> <i>neqa</i> <i>neqet amllertut maani</i> <i>qimugtut neqait</i> <i>nangyarpiartut</i> <i>neqtulnguunga</i> <i>neqa unguvangraan</i> <i>uklia</i> <i>neqngurtuq</i> <i>nereneqaiq, neqiaq</i>	'dog, chum salmon, fish' 'small fish found in lakes' 'food;fish' 'the fish are plentiful here' 'the dogs' food is almost gone' 'i'm tired of eating fish' 'even though the fish is still alive he is cutting it up' 'there was food everywhere', <i>lit.</i> 'it became food' 'food-stealing bird'
Boiled fish	<i>egaaq</i>	'any cooked fish or other food'

Bundled fish	<i>inartaq</i>	x
Canned fish	<i>paankaraq</i> <i>qakiiyak paankarak</i> <i>uksuqu nernalukek</i>	x ‘he is canning two silver salmon so that he can eat them in winter’
Cut fish	<i>cegesseg-</i> <i>cegtuq</i> <i>cega, ceggaa</i> <i>ceg’aq, cegg’aq</i> <i>seg-</i> <i>ulligte-</i> <i>ulligtuq</i> <i>ulligtaaa</i> <i>ulligciuq</i> <i>ulligtaq</i> <i>ingqii-</i> <i>inguqin, inguqitaq</i> <i>neq’liur-</i> <i>neq’liurtuq</i>	‘to cut fish for drying’ ‘she is cutting fish’ ‘she is cutting it’ ‘a fish cut for drying’ (see ceg-) ‘to cut fish for drying, in the traditional manner, making cuts so that air can reach all parts of the flesh; (NUN) to turn over’ ‘it is cut for drying’ ‘she cut it for drying’ ‘she is cutting it for drying’ ‘fish cut for drying’ ‘to make the horizontal cuts in fish flesh while preparing it for drying’ ‘board on which one prepares meat or fish’ ‘to work on fish (cleaning it, etc.)’ ‘he is working on fish’
Fish cut in half	<i>qup’ayagaq(NUN)</i>	‘fish cut in half to hang and dry’
Dried fish	<i>neqaluk (NUN)</i> <i>neqerrluk</i> <i>palircima</i>	x x ‘to be burnt by the sun (of dried fish)’
Dried small fish	<i>nevkuq</i> <i>ulligtaruaq</i>	x ‘split and dried small fish, such as whitefish, pike or trout’
Dried fish heads	<i>nasqurrluk</i>	‘cut and dried fish-head’

	<i>qamiqurrluk</i> <i>irniani nerevkaraa</i> <i>tepnək</i>	(see above) ‘she let her child eat some aged fish heads’
Dried frozen fish	<i>yay’ussaq</i>	‘dried tomcod or whitefish that has been frozen all winter’
Air dried fish	<i>tamuaneg</i>	x
Fish dried in a basket	<i>tut’at (plural)</i>	‘fish packed down and dried in a basket’
Fish partially dried and boiled	<i>egamaarrluk</i> <i>teggmaarrluk</i>	x ‘boiled, half-dried salmon; dog salmon, chum salmon’
Frozen fish	<i>cegetaq</i> <i>kumlaneq</i> <i>nutaqaq</i> <i>qercuqaq</i>	
Poke fish	<i>uqumaarrluk</i>	‘fish slightly aged and stored in seal oil’
Fish partly smoked and stored in seal oil	<i>arumaarrluk</i>	x
Fish in strips	<i>kiarnek</i> <i>palak’aaq (BB)</i>	‘unsalted strip or fillet of fish flesh without skin, cut from along the backbone and hung to dry’ ‘strip of dried flesh’
Dried Fish tails	<i>parmesqatak</i> <i>papsalqitaq</i>	x ?
Fish strung to dry	<i>piirrarrluk (Y, HBC)</i>	‘small fish, such as tomcod strung up for drying’
Fish hung to dry	<i>kanartaq</i>	x
Raw fish	<i>qassaq, qassaulria</i> <i>qassar-</i> <i>qassartuq</i> <i>qassaraa</i>	‘raw fish or meat’ ‘to eat raw fish or meat’ ‘he is eating raw fish’ ‘he is eating it raw’
Raw frozen fish	<i>quaq</i>	‘fish to be eaten raw and frozen’
Cooked piece of fish	<i>ukliaq</i>	x

Fish bin	<i>qikutaq</i>	‘bin used for temporary storage of fish before they are cut up for drying’
Fish trap	<i>taluyaq</i>	x
Fish rack	<i>initaq</i> <i>ker’aq</i> <i>qer’aq</i>	‘part of a fish rack on which the fish is directly hung’
Fish wheel	<i>akalria</i>	x
Fish fence	<i>capon</i> <i>angutet capcirtut</i> <i>uqvianek</i> <i>manignarrnaluteng</i> <i>taluyakun</i> <i>kalgun</i>	‘weir, fish fence; wall’ ‘the men set a weir of willows to catch loche with a fishtrap’ ‘weir, fish fence extending from the bottom of the river and leading fish to a place where one can catch them with a dipnet’
Fish spear	<i>aggsuun</i> <i>ag’ssuun</i>	x x
Fishing line	<i>ipiutaq (NSU)</i>	x
Fish camp	<i>kiagvik</i> <i>neqlilleq</i>	‘summer fish camp’ (see above)
Fish Village	<i>neqlercurvik</i>	‘fish village, site on the lower Yukon’
Fisherman	<i>neqsurta</i> <i>neqsurtuq</i> <i>neqsurvik</i> <i>neqsurtuq</i> <i>tuniarkaminek</i> <i>aataka neqsurteng’uuq</i>	x ‘he is fishing’ ‘fishing place’ ‘he is fishing commercially’ ‘my father is a fisherman’
Fish hook	<i>iqsak</i> <i>iqsag/manaqutaq</i>	x ‘to fish with a hook and

	<i>iqsagtuq/manartuq</i> <i>iqsagaa/manaraa</i> <i>manaq</i> <i>manar</i> <i>manaryartuq</i> <i>qerrlurcaq</i>	line, to jig for fish' 'he is hooking for fish' 'he hooked it' 'fishing lure with hook' 'to fish with a hook, lure, and line, usually (though not necessarily) through a hole in the ice in winter' 'he went to fish with a hook and line' 'fishhook which is baited and set below the ice, held in place with a stick across the hole, and left unattended to be checked periodically'
Fish net	<i>kuvyaq, kuvya, kuvsaq</i> <i>kuvya</i> <i>kuvyauq</i> <i>kuvyaq cangliqellruuq</i> <i>nutaranek</i> <i>qemiraa kuvyaq</i> <i>qilagcuutmek aturluni</i> <i>kuvyaq civtaa</i> <i>kuvyaq takuua</i> <i>kuvyarka</i> <i>qelcaq (Y)</i>	x 'to fish by drift-netting or purse-seining' 'he is drift-netting' 'the net caught lots of fresh fish' ' he is stringing the net using a net shuttle' 'he set the net' 'he checked the nets' 'twine for making nets' 'net into which fish are driven by peopole who walk in and thrash the water'
Set net	<i>petugaq</i>	x
Fine mesh net	<i>caqutaugaq(NUN)</i>	'fine mesh net for dog salmon, worked by hand by men standing in the water, not left unattended'

Net shuttle	<i>imgutaq</i> <i>qilagcuun</i>	x x
Net setting line	<i>amun</i> <i>atlirneq</i> <i>nuvun</i> <i>qemiq</i> <i>qemirtuq</i> <i>qemiraa</i>	‘line used to set and reset a net under the ice’ ‘lead line of fish net’ ‘threading device (such as the line used to set a net under the ice, or a needle threader)’ ‘lead line or float line of a net’ ‘he is stringing (a net)’ ‘he is stringing it’
Net sinker	<i>kic’aqutaq</i>	x
Fishing rod	<i>manaq</i> <i>piqrutaq</i>	‘fishing lure with hook’
Roe	<i>cin’aq</i> <i>cilluvak</i> <i>imlauk</i> <i>meluk</i> <i>melug</i>	‘salmon egg, especially aged salmon egg’ ‘fish egg, roe’ ‘fish eggs, roe; fish eggs prepared by allowing them to age and become a sticky mass’ ‘to suck; to eat roe directly from the fish’
aged roe	<i>cuak</i>	x
herring roe	<i>imlauk (NUN)</i> <i>qaarsaq</i> <i>qiaryaq (NUN)</i>	‘dried herring egg’ x ‘herring eggs, so called because they crackle when eaten’
fish rack	<i>ker’aq (NSU)</i> <i>qer’aq</i>	x x
trout	<i>anerrluaq (BB)</i> <i>anyuk (BB)</i>	‘type of fish, salt-water trout’ x

lake trout	<i>cikignaq</i>	x
steelhead trout	<i>irunaq</i>	x
rainbow trout	<i>talaariq</i>	x
dolly varden (char)	<i>iqallugpak</i>	x
herring	<i>iqalluarpak, iqallugpak</i>	x
Arctic cod	<i>iqalluaq</i>	‘boreal smelt’
Pike	<i>uksumi-llu iqsagnaurtut cuukvagnek</i>	‘and in the winter they would hook for pike’
Wolf Fish	<i>qugautnaq (NI, NUN)</i>	x
Smokehouse	<i>elagyaq</i> <i>puyurcivik talicivik</i> <i>neqnek aruvarqiyartua talicivigmi</i>	‘partially underground cache; pit for cleaning fish; smokehouse’ x ‘shelter for smoking fish, smokehouse’ ‘go smoke the fish in the smokehouse’
Smoked Fish	<i>aruvarqi- aruvir- puyurqe puyurte-</i>	‘to smoke fish’ ‘to be smoky; to smoke (fish)’ ‘to be smoked; to feed the fire when smoking fish’ ‘to smoke (fish)’
Subsistence	<i>angussaag- yuungnaqe-</i>	‘to hunt, to try to catch game’ ?

4. The Dena’ina Language

There is a dramatic difference in language retention between the Yup’ik of the Nushagak and Kvichak River watersheds and the Dena’ina of the Iliamna Lake and Lake Clark area. In contrast to the Yup’ik, the Dena’ina population is much smaller, estimated by Krauss (2007:408) at 1,000 for the Iliamna/Lake Clark area and Cook Inlet Basin. Krauss estimates that within this population there are only 50 Dena’ina remaining speakers (see Table 6), most of whom live in

the vicinity of Nondalton or Lime Village (the latter outside the study area in the Kuskokwim River drainage). The youngest active Dena'ina speaker is 64 years old. Dena'ina is, thus, one of the world's most endangered indigenous languages (Boraas 2010:2). The reason for the disparity between Dena'ina and Yup'ik language usage is complex but the main reason for Dena'ina language extinction was the Alaska Territorial School's federally mandated policy of punishment for children speaking their indigenous language in school. This forced assimilation policy occurred to various degrees throughout Alaska but its application seems to have been particularly harsh in Dena'ina territory (Boraas 2010:2).

Given the importance of language to cultural identity, the Dena'ina have begun to revitalize their language and significant efforts are underway to avoid its extinction both in spoken and written form (cf. Boraas and Christian 2010). There is a history of Dena'ina elders working with linguists dating back to Anna Brigitta Rooth's (1971) work in 1966 in Nondalton followed by dozens of bilingual publications by James Kari working in collaboration with Dena'ina speakers starting in the 1970s and the bilingual publication of Joan Tennenbaum (1984). More recently a number of speakers from Nondalton and Lime Village have participated in Dena'ina Language Institutes, sponsored by a consortium of institutions including the Alaska Native Language Center, Alaska Native Heritage Center, the Sovereign Nation of the Kenaitze, and Kenai Peninsula College. The one to three-week institutes have been held at various locations including Nondalton and include workshops on Dena'ina language learning and teaching. Recently, two speakers from the study area, Andrew Balluta of Nondalton/Newhalen and Walter Johnson of Pedro Bay now of Homer have collaborated with linguist James Kari on important bilingual publications: *Shtutda'ina Da'a Shel Qudel: My*

Forefathers are Still Walking with Me (Balluta 2008) and *Sukdu Nel Nuhtghelnek: I'll Tell You a Story: Stories I Recall from Growing Up on Iliamna Lake* (Johnson 2004). Finally, numerous speakers living and deceased (through archived recordings) contributed to *Dena'ina Elnena [Dena'ina Territory]: A Celebration* edited by Karen Evanoff (2010).

The language is indicative of the importance of water and salmon and other fish to the Dena'ina. Streams are intimately tied to the Dena'ina psyche through language. The Dena'ina words for directions are not based on the cardinal directions, but on the concept of upstream or downstream. A Dena'ina description of direction results from combining one of five stems, indicating upstream, downstream, and related terms; one of six prefixes, indicating proximity; and a suffix indicating general direction or location (Kari, 2007:336). For example, the word “*yunit*” combines the stem “*ni*” (upstream) with the prefix “*yu*” (distant) and the suffix “*t*” (at a specific place) and means “at a specific place a long way up upstream.” If one were using that phrase at Iliamna, *yunit* would mean the direction toward Nondalton, which is a specific place far upstream; in this case, the direction would be north, because from Iliamna the Newhalen River flows south.

Because of the importance of stream stems reflecting a fundamental cultural construct affecting a wide range of cultural activities (subsistence, diet, travel, directions, spirituality etc.) Kari (1996) has proposed migration theory for Dena'ina and other Athabascans (who employ a similar directional system) based on variants in the stream stem morpheme. Kari suggests a movement of people from northern British Columbia, to the Yukon River area to the Kuskokwim piedmont, to Dena'ina territory. Boraas (2007:35) believes this to be the best hypothesis of Dena'ina origins to date.

The spirituality of water is also embedded in the language. The Dena'ina have 36 terms for streams (Kari 2007:123-4), among those the primary word for 'water' is of special note. The Dena'ina word for "water" *vinl̄ni* (in the Inland dialect, *mil̄ni* in the Outer dialect) is unique among other Athabascan/Dene languages and Dena'ina linguist James Kari considers it to be esoterogenic meaning a special word reflecting special importance or sacredness (personal communication, James Kari, December 6, 2011). Dena'ina elders Clare Swan and Alexandra Lindgren (2011) state "the Dena'ina word for water was held sacred" and by implication the water was sacred. The word *vinil̄ni* and its sacred connotations is reflected today in the Orthodox Great Blessing of the Water ceremony described in section III.F.3 in which river water is annually baptized and made holy.

The Dena'ina named a general category of animal or plant by the name of its most important representative. For example, the name for animal is *ggagga*, for brown bear, and the name for tree is *ch'wala*, for white spruce. Not surprisingly, the name for fish is the name for salmon, *liq'a*. Table 8 is a compilation of Dena'ina terms for salmon, freshwater fish, and fishing technology which, like the Yup'ik counterparts, shows an intimate connection with salmon, fish, and fishing.

Table 8. Dena'ina Terms Involving Salmon, Freshwater Fish and Fishing Technology.
(x means literal translation same as English term.) Data from Kari (2007)
Dialect notations: I = Inland, U=Upper Inlet, O=Outer Inlet, L=Lime Village,
Il=Iliamna, S=Seldovia, Lk-i=Kuskokwim Deg H'tan, Su=Susitna Station, E=Eklutna,
Ty Tyonek, T=Talkeetna, Kn=Knik

English Term	Dena'ina Word	Literal Meaning
salmon (generic) (<i>Oncorhynchus spp.</i>)	<i>liq'a (IU)</i> <i>luq'a (OSI)</i>	x x
Male fish	<i>Hest'a, qest'a (IO)</i> <i>Tl'ech'I (U)</i>	
Female fish	<i>Q'in'i</i> <i>Q'inch'eya (IO)</i> <i>Q'inch'ey (U)</i>	'roe one'
Small fish	<i>Chagela gga (U)</i> <i>Shagela gguya (I)</i> <i>Shagela ggwa (O)</i>	
Fry, baby fish	<i>Lch'eli, dghelch'eli</i>	'shiny one'
Bottom fish	<i>Tahliq'a (IU)</i> <i>Tahluq'a (O)</i>	'underwater fish'
Spring fish run	<i>Litl'eni (UI)</i>	x
Spring fish caught under ice	<i>Ten t'uhdi (U)</i>	x
king salmon, Chinook salmon (<i>O. tshawytscha</i>)	<i>liq'aka'a (IU)</i> <i>luq'aka'a (O)</i> <i>chavicha, tsavija (O)</i>	"big salmon" <Rus.
king; salmon sizes: smallest	<i>liq'agga (U)</i> <i>ggas ten'a (L)</i>	'small salmon' 'king salmon's handle'
two-foot king salmon	<i>q'inagheltin (U)</i>	'?'
largest king salmon	<i>liq'aka (U)</i> <i>vigit'in (L)</i>	'big salmon' x
middle-sized king salmon	<i>tl'istqeyi (U)</i>	x
humpback salmon, pink salmon (<i>O. gorbuscha</i>)	<i>qughuna (OUSI)</i>	'humped'
red salmon, sockeye salmon (<i>O. nerka</i>)	<i>liq'a (I)</i> <i>t'q'uya (LNOSI)</i> <i>k'q'uya (ON)</i> <i>q'uya (U)</i>	x 'ridged'
nickname	<i>veghutna qilin (I)</i>	'it exists for people'
old fall sockeye	<i>bendashtggeya (U)</i> <i>dghelbek'i (UO)</i>	'partially white' a rare verb stem
dog salmon, chum salmon (<i>O. keta</i>), (I) early summer	<i>alima (OI)</i> <i>seyi (U)</i>	< Esk.. x

chum salmon	<i>nulay (NL)</i>	‘runs again’
August run dog salmon	<i>shighat’iy (Lk-i)</i>	“?”
silver salmon, coho salmon (<i>O. kisutch</i>)	<i>nusdlaghi (I)</i> <i>nudlaghi (O)</i> <i>nudleggha, nudlegghi (U)</i>	‘one that swims back’
steelhead trout (<i>Salmo gairdneri</i>)	<i>usdlaghi (O)</i> <i>telaghi (II)</i> <i>tuni, tuni denlkughi (N)</i> <i>shagela (U)</i>	? ‘one that swims past’ ‘one that runs’ ‘water one’ ‘fish’
running salmon	<i>tuzdlaghi (OI)</i> <i>tuydlaghi (U)</i>	‘one swimming in water’
fish laying eggs	<i>taq’innelyaxi (I)</i> <i>taq’innelyashi (UO)</i>	x
spawned-out salmon	<i>nudujuzhi, dujuzhi (I)</i> <i>dujuyi (U)</i> <i>itak’i (O)</i>	x x x
dead salmon	<i>tilani</i>	X
fall salmon, esp. sockeye	<i>hey luq’a (O)</i> <i>hey liq’a (IU)</i>	‘winter salmon’
fingerling, baby salmon, alevin	<i>tuyiga (OI)</i> <i>liq’agga (U)</i> <i>liq’a gguya</i>	‘water spirit’ ‘little salmon’
first fish run	<i>qtsa ghelehi</i>	x
last fish run	<i>q’ech’en ghelehi (I)</i> <i>unhtl’uh ghelehi (UO)</i> <i>unhtl’uyeh (I)</i>	x
old female salmon	<i>q’in ch’ezhi (I)</i> <i>q’in ch’eya (U)</i>	‘infested roe’
red-colored salmon	<i>nuditq’azhi (I)</i> <i>nishtudghiltani (U)</i>	‘one that is red’ ‘that which floats in midstream’
spring (early) salmon run	<i>ts’iluq’a (O)</i> <i>litl’eni (UI)</i>	‘straight salmon’ ‘spring one’
summer salmon run, sockeye season	<i>chiluq’a (O)</i> <i>hchiliq’a (UI)</i> <i>shanlaghi (UI)</i>	x ‘summer run’
fall-winter running salmon	<i>tuleha (OU)</i> <i>tulehi (I)</i>	‘one running in water’
dead salmon that drift ashore	<i>niqatayilaxi (I)</i>	x
salmon captured in weir	<i>q’anughedeli</i>	‘those swimming back’
Non-salmon fish	<i>Shagela (IO)</i> <i>Chagela (UII)</i>	‘fish’

	<i>Chebay (U)</i>	
Alaska blackfish	<i>Huzheghi, huzhehi (L,N)</i>	‘gaping thing pointing up’
Freshwater sculpin	<i>Ch’qenlt’emich’a</i> <i>Ch’qenlt’emch’a (NL)</i> <i>Ch’qeldemich’a (Il)</i> <i>Ts’est’ugh’I, ts’est’uhdi (U)</i>	? ‘the one beneath rocks’
Burbot, lingcod	<i>Ch’unya (I)</i> <i>Ch’anya (U)</i> <i>K’ezex (Lk-i)</i>	
Burbot’s chin barbell	<i>Veyada k’ich’aynanik’et’i</i>	‘one that hands out from chin’
Arctic char	<i>Vat (NL)</i>	
Eel, lamprey	<i>Suy liq’a</i> <i>Liq’a q’int’s’a</i> <i>Lizil (O)</i> <i>Tl’eghesh (I)</i>	‘sand fish’ ? ‘salmon roe female’ ‘dog windpipe’
Large lamprey	<i>Ts’ilt’en hutsesa (U)</i>	‘arrow nock’
grayling	<i>Ch’dat’an (I)</i> <i>Ch’dat’ana (U)</i>	‘one with a blanket’
Grayling’s dorsal fin	<i>Vech’eda</i>	‘It’s blanket’
Freshwater herring, least cisco	<i>Ghelguts’I k’una (N)</i>	‘pike’s food’
Three-spined stickleback	<i>Dghezhi, dghezha (O)</i> <i>Dgheyay (U)</i> <i>Dghezhay (I)</i> <i>Vek’eha qilani (NL)</i> <i>Tuyiga (Il)</i>	‘thorny one’ ‘one with quills’ ‘water spirit’
Spawning stickleback	<i>Bente qiyuya (U)</i>	‘one going in lakes’
Northern pike	<i>Ghelguts’I (I)</i>	‘swift swimmer’
Small pike	<i>Tl’egh tuzhizha</i>	‘grass water beak’
sheefish	<i>Shish (L)</i> <i>Zdlaghi (L)</i>	‘one that runs’
sucker	<i>Duch’ehdi (IU)</i> <i>Dehch’udya €</i> <i>Lih (O)</i>	‘open mouth one’
Brook trout, Landlocked Dolly Varden char	<i>Dghili juna (NL)</i> <i>Dghili chuna (Il)</i> <i>Dghelay tsebaya (T)</i>	‘mountain dark one’ ‘mountain fish’
Lake trout	<i>Zhuk’udghuzha (I)</i> <i>Bat (Su)</i>	‘spiny mouth’
Rainbow trout	<i>Tuni (I)</i>	‘water one’

	<i>Telaghi (U)</i> <i>Shagela (Il)</i>	‘one that swims, runs’ ‘fish’
Dolly Varden trout	<i>Qak’elay (I)</i> <i>Qak’elvaya (Il)</i> <i>Telch’eli (O)</i> <i>Chebay (U)</i> <i>Liq’a k’qen (I)</i>	? ? ‘shiny one’ ‘fish’ ‘salmon’s husband’
Whitefish (any)	<i>Lih (UI)</i>	
Alaska whitefish	<i>Hulehga (I)</i> <i>Q’untuq’ (Lk-i)</i>	‘runs up’ ‘ridge on top’
Broad whitefish	<i>Telay (L)</i>	‘swimmer’
Broad whitefish stomach	<i>K’jida (I)</i> <i>K’eghezh (Lk-i)</i>	‘oval’
Round whitefish, pin-nose whitefish	<i>Hasten (IT)</i>	‘pus handle’
Fish guts (all)	<i>K’inazdli, vinazdli</i>	‘inner objects’
Fish bones	<i>K’iztin (IO)</i> <i>K’iytin (U)</i>	‘inner long object’
Fish backbone	<i>K’eyena</i>	x
Fish belly	<i>K’eveda</i>	x
Dark fish blood along backbone	<i>K’tl’ech’ (I)</i> <i>K’kuhashga (I)</i> <i>K’kukelashch’a (L)</i> <i>K’chashga (U)</i> <i>K’kuhash’a (O)</i>	x
Dark salmon meat near skin	<i>Beyes tut’ tsen (UO)</i>	
Fins (any)	<i>K’ts’elghuk’a (I)</i> <i>K’ch’elna (OU)</i> <i>K’tay’a (U)</i>	x ‘wings’ ‘paddle’
Pectoral fin	<i>K’ch’enla (U)</i> <i>K’ts’elghuk’a (I)</i>	‘wing’
Dorsal fin	<i>K’iniq’ ts’elghuk’a</i> <i>Ghuk’a (I)</i> <i>Biniq’ ch’elna (U)</i> <i>K’inhdegga (O)</i>	‘back fin’ ‘back swimmer’ ‘back wing’ ‘back collarbone’
Pelvic fin	<i>K’t’egha (U)</i> <i>nilk’degga (O)</i> <i>k’eveda degga (I)</i> <i>nich’ k’eltin’a (O)</i>	‘paddle’ ‘paddles together’ ‘belly fin’ ‘one in the middle’
Anal fin and cartilage	<i>K’tselt’s’ena (U)</i> <i>K’tseldegga (IO)</i>	‘anal bone’ ‘anal collarbone’

Adipose fin	<i>K'tagh'a (IO)</i> <i>K'tach'elvasha (N)</i> <i>Tak'elbasha,</i> <i>k'tach'ebasha (OU)</i>	'paddle' 'submerger'
Tail fin	<i>K'kalt'a degga (O)</i> <i>K'kalt'a ts'elghuk'a (I)</i>	x
Fresh air sack	<i>K'kuhlet'</i>	x
Fish collarbone, pectoral girdle	<i>K'degga</i>	x
Fish head gristle	<i>K'enchigija</i>	'head cartilage'
Fish meat	<i>K'enut'</i> <i>Duni (II)</i>	x 'food'
Fish tail	<i>K'kalt'a</i>	x
Meat next to fish tail	<i>K'kalt'a veghun</i>	'body of fish tail'
gills	<i>K'q'eshch'a</i>	x
Gut with stringy end (pyloric caecum)	<i>K'delchezha (OII)</i> <i>K'delcheya (U)</i> <i>K'jida</i>	'rattle'
Fish heart	<i>K'ggalggama (I)</i> <i>K'ggalggamam'a (IIOI)</i> <i>K'ghalggamama (U)</i> <i>K'qaldema (T)</i>	x
Hump on salmon's back	<i>K'eyenghezha (OI)</i>	x
Male sperm sac	<i>Hest'a vekulashga (I)</i>	x
Sperm, milt	<i>K'tl'ech'</i>	x
Nose cartilage	<i>K'ingija, k'engija (IOU)</i> <i>K'ingeja (II)</i>	x
Oily strip of meat in front of dorsal fin of salmon	<i>K'int'sisq'a (U)</i> <i>K'vin tseq'a (I)</i> <i>K'intsiq'a (OI)</i>	'back strip'
Roe, fish eggs	<i>Q'in</i>	x
Roe sac	<i>K'q'in yes</i>	x
scales	<i>K'gguts'a (O)</i> <i>K'ggisga (IU)</i>	x
Fish slime	<i>K'eshtl'a (OII)</i> <i>K'tl'eshch'a (IU)</i>	x
net-making tool, net stringer	<i>tahvil vel k'etl'iyi,</i> <i>tahvil qeytl'ixi</i> <i>tahvil dugula (I)</i>	'with it he weaves net'
net rack	<i>veq' k'etl'iyi</i> <i>veq' nuk'detggeni</i>	'on it he weaves something.' 'on it, it is dried'

net mesh measure	<i>ve» k'ettl'iyi</i>	'with it, it is woven'
fishing clothes	<i>va liq'a ch'el'ih</i>	x
awl for stabbing salmon	<i>ts'entsel (U)</i>	
bale of fish	<i>vava hal</i>	'dry fish pack'
cutting board	<i>veq' huts'k'det'esi</i>	x
dipnet, long-handled dipnet	<i>tach'enil'iyi (UO)</i> <i>nch'equyi (LN)</i>	x
short-handled dipnet	<i>tach'enil'i (I)</i>	x
salmon dipnet (longer handle)	<i>shanlaghi tach'nil'iy (I)</i>	'summer run dipnet'
trout dipnet	<i>taztin (I)</i>	x
dipnet frame	<i>taztin duves (I)</i>	x
fish bait (on hook)	<i>k'eneleha (O)</i> <i>k'inleha (I)</i> <i>k'indneha (U)</i> <i>k'egh dghichedi</i> <i>bel ch'k'nulneq'i (O)</i>	x
rabbit or ptarmigan guts used for tomcod bait	<i>k'entleh, k'entleq' (U)</i>	x
natural rock hole fish bin	<i>tsaq'a (I)</i>	x
rock fish bin, fish cutting hole	<i>k'usq'a (NL)</i> <i>k'esq'a (OI)</i> <i>k't'usq'a (U)</i>	'cutting cavity'
fish box	<i>shagela yashiga</i>	x
fish club, seal club	<i>tsik'nigheli (IO)</i>	x
angled fish fence, dipnetting dock	<i>tanatl'ini</i>	'woven into water'
fish fermenting hole	<i>chuqilin q'a (O)</i> <i>chaqilin q'a (IU)</i>	x
gaff hook, branch hook, leister	<i>qishehi (IU)</i> <i>k'isheq'i (II)</i> <i>sheh (L)</i> <i>shehi (O)</i>	'hooker'
fish hook	<i>ihshak, iqshak (OI)</i> <i>k'inaq'i, k'eninaq'i (U)</i>	Eskimo origin
Note: eleven separate types of named fish hooks		
fishing hole, fish trap location	<i>k'enq'a (OU)</i> <i>k'inq'a, -k'inq'a'a (I)</i>	x
fish trap location	<i>tach'k'el'unt</i>	'where we set object'
fish jigging hole in ice	<i>tasaq'a</i> <i>tatsiq'a (II)</i> <i>ges aq'a (L)</i>	'water head hole'

fishing line	<i>shehi tl'ila (O)</i> <i>k'inaq'i tl'ila (U)</i> <i>iqshak tl'ila (I)</i>	'hook line'
fishing pole	<i>iqshak ten (IO)</i> <i>shehi ten (O)</i> <i>k'inaq'i ten, k'inaq'i</i> <i>nikena, k'niten, k'neten</i> <i>(U)</i>	x
fishing reel	<i>shehi tl'ila telcheshi (UO)</i>	
fishnet	<i>tahvil</i>	'underwater snare'
net-like fish drag	<i>nich' nuk'tasdun (SITy)</i>	'in back is hole'
Russian-era fishnet	<i>sétga (O)</i> <i>satga (U)</i>	Russian origin
drift net	<i>te»edi (I)</i>	'one that floats'
gunny sack net	<i>chida yiztl'ini tahvi» (I)</i>	
seine net	<i>vel niqak'idzehi</i> <i>nébod (O)</i>	'with it one scrapes in circle' Russian origin
sinew net	<i>ts'ah tahvil</i>	x
twisted willow bark fiber net	<i>ch'eq' tahvil (IU)</i>	x
small hole, net mesh,	<i>k'eniq' (IO)</i> <i>k'eneq' (OU)</i>	x
net drying rack	<i>tahvil denluh</i>	x
lead line	<i>duyeh vetsik'teh'i</i> <i>duyeh vetsittehi (I)</i>	x
corks, floats	<i>tahvil ts'esa (IO)</i> <i>tahbil jija (U)</i>	x
cork line	<i>vetsik'teh'i</i>	x
fish pew, pike	<i>liq'a el dalyashi (OU)</i> <i>liq'a vel telyayi (I)</i>	x
fish scaler, ulu knife	<i>vashla</i> <i>bel k'elggits'i (U)</i>	'little stone'
fish spreader stick	<i>k'enun'i</i> <i>nuk'ilqeyi</i>	x
hoop fish spreader	<i>dnalch'ehi (I)</i>	x
small fish spreader	<i>t'utseyyi (O)</i>	x
hand-held fish snare with handle	<i>k'entsa quggil (I)</i>	x
spruce root fish snare	<i>qunqelashi quggil (OU)</i>	x
fish stringer	<i>k'e'esh tl'il (OU)</i>	x
willow fish stringer	<i>q'eyk'eda (IU)</i>	'tough willow'
fishtrap, woven basket style trap	<i>taz'in (IO)</i> <i>tay'in (U)</i>	'object that is in water'

Note: Seventeen types of fishtraps for different species and conditions		
fishtrap funnel	<i>k'eshjaya (I)</i>	x
inner basket	<i>k'jaya (OU)</i>	'heart'
angled leads to trap	<i>taztin (I)</i>	'long object that is set'
long stick ribbing on fishtrap	<i>talyagi (IO)</i> <i>talyashi (U)</i>	x
spiral sticks on fishtrap	<i>k'etnalvesi (L)</i>	x
branch drag material put in weir	<i>k't'un dighali (U)</i> <i>k't'un dalghali (I)</i>	x
inner spruce bark reflectors pinned to bottom of weir	<i>tah'iggeyi (U)</i> <i>vejink'ehi (I)</i>	'under water turns white' 'stg. swims over it'
vertical stakes for weir	<i>dik'ali</i>	x
fish wheel	<i>niqak'uquli (I)</i> <i>niqaghetesi (U)</i> <i>naqak'ulqu»i taz'in (O)</i>	'scoop that turns'
lead line	<i>duyeh vetsik'teh'i</i> <i>duyeh vetsittehi (I)</i>	x
net-making tool	<i>tahvil vel k'etl'iyi</i> <i>tahvil dugula (IL)</i>	x
net rack	<i>veq' k'etl'iyi</i> <i>veq' nuk'detggeni</i>	x

III. MODERN CULTURE

A. Interview Synopsis

Table 9 is a synopsis of respondents to the semi-structured interviews. The interview process is described in the Introduction and readers should refer to that section and note the questions were not designed to elicit a simple yes/no-type response (nominal data) but rather to elicit a narrative of how the interviewee felt about the topic in order to give a richer and more nuanced understanding of cultural patterns and values. The “Voices of the People” are a reflection of those deeper understandings. However, Table 9 has been derived from the interviews in order to give the reader a sense of the overall consensus or variation from consensus of the respondents. To accurately depict cultural practices we read the interviews and characterized the response as Agree, or Disagree/Neutral for each interview question generating nominal data. This data includes 47 interviews, the number transcribed at the time of the analysis (un-transcribed interviews were from Dillingham and Pedro Bay). Sometimes respondents in a group took up a topic at a later time during the interview in which case we included that response as it applied to a previous question. As discussed in the Introduction, not everyone responded to every question. In a small-group setting often one person would respond and others would nod or otherwise express agreement with the speaker. We only recorded the verbal response, not non-verbal indications of concurrence. If elders were tiring in the course of the two-hour sessions, or if the session went long we often skipped questions to shorten the interview time.

The responses represent consensus or near consensus: 694 responses were positive and 18 were negative or neutral. The data indicate elders and culture bearers reflect indigenous cultural

standards that have a very high degree of homogeneity as represented by this set of questions revolving around the importance of salmon and streams in their lives. Responses to interview questions are used in the Modern Culture sections (III) that follow with statements like: “interviewees universally felt...,” “interviewees predominantly stated...,” or “interviewees indicated....”

Table 9. Nominal Evaluation of Interview Responses to Semi-Structured Interview Questions. Based on 47 Interviews.

Question	Positive	Negative or Neutral
1. Are salmon critically important in your lives? Note: often asked: “If the salmon were to disappear for whatever reason, how would it affect your lives?” <i>Positive means people perceive salmon to be critically important in their lives: negative means salmon are not perceived to be critically important.</i>	40	0
2. How many times in a week or a month do you eat salmon or other fish? Is it different during different seasons? <i>Positive means three or more times a week or “all the time.” Negative is less than three times a week or “seldom.”</i>	35	0
3. Do people in your village need to eat salmon to be healthy? How does salmon maintain or improve physical or emotional health? <i>Positive means people perceive they need salmon and other wild foods to be healthy. Negative means they do not perceive salmon to be necessary for health and wellbeing.</i>	37	0
4. Which foods are important to give to a child so that he or she will grow up to be smart or strong? <i>Positive means salmon and other wild foods are perceived to be necessary for children’s health. Negative means salmon and wild foods are not necessary and children can eat commercially purchased food and be healthy.</i>	30	2
5. Does it matter to you if the salmon you eat is wild salmon? Does it matter to you if the salmon comes from the streams and rivers in your area? <i>Positive means people perceive that the salmon they harvest and</i>	40	1

<i>consume must be wild salmon from local streams. Negative means it doesn't matter where the salmon comes from.</i>		
6. Does it matter to you that the salmon are connected to the salmon your ancestors ate? <i>Positive means salmon genetically connected to fish their ancestor's ate is perceived to be important. Negative means there it is not important that the salmon are genetically connected to ancestral harvests.</i>	27	0
7. If the fishing practices and care for the streams and rivers are good (what the ancestors call, 'without' impurity, Dena'ina <i>beggesh quistlagh</i>), does it result in salmon coming back? <i>Positive means proper practices are perceived to result in the salmon's return. Negative means practices have no effect on the salmon's return.</i>	37	0
8. Have you observed changes in the numbers of salmon that come back each year? Is there a big difference some years? If there is, what do you think causes these differences? <i>Positive means people have observed changes in the number of returning salmon. Negative means people have not observed changes in number of returning salmon.</i>	31	0
9. Are salmon important for the lives of other animals or birds that are important to the Yup'ik or Dena'ina? What would happen to these animals or birds if they can't eat the salmon? <i>Positive means salmon are important to other animals. Negative means salmon are unimportant to other animals.</i>	35	0
10. Who do you share food with? Relatives in Anchorage, Dillingham? Elders? Who decides how to share the salmon, and who to give salmon to? <i>Positive means wild food is shared with family and/or friends living outside of the area. Negative means wild food is not shared outside the area.</i>	31	1
11. Do you share salmon with people who don't do subsistence and what type of things to you get in return? <i>Positive means salmon are shared with people who don't do subsistence. Negative means salmon are not shared with people who don't do subsistence.</i>	14	0
12. What does it mean for families to go fishing together? Do young people learn a lot at fish camp? How do you teach the young people to catch salmon? Do you teach young people to respect the salmon? <i>Positive means it is important for families to fish together. Negative means it is not important for families to fish together.</i>	41	0

13. How do you feel when you give salmon? How do you feel when you are given salmon? <i>Positive means people feel good when they give or receive salmon. Negative means people have no particular emotion when they give or receive salmon.</i>	33	0
14. Do you feel an obligation to return the favor when someone gives you salmon? <i>Positive means people feel no obligation to return the favor of a salmon gift. Negative means people feel an obligation to return the favor of a salmon gift.</i>	5	0
15. Are salmon and other wild foods eaten in community celebrations? Is this important? <i>Positive means it is important to include salmon and wild foods in community celebrations. Negative means it is not important that salmon and wild foods are included in community celebrations.</i>	27	1
16. It has been said that most Yup'ik/Dena'ina believe that a wealthy person is one with a large family. Do you think that family is more important than material wealth? <i>Positive means the person believes family is more important than material wealth. Negative means material wealth is more important than family.</i>	36	1
17. Do you do anything to make sure the salmon will return? <i>Positive means people do specific practices or rituals to assure the salmon return. Negative means people do not do any specific practices or rituals to assure the salmon return.</i>	37	2
18. What would it mean to treat salmon badly? Why is this bad? <i>Positive means there are specific things that are identified as bad practices with negative consequences. Negative means there are no specific things identified as bad practices with negative consequences.</i>	9	3
19. Did the old people tell of a time when there would be a disaster and the fish would disappear? <i>Positive means people heard elders tell prophetic stories of the disappearance of salmon. Negative means people never heard elders tell prophetic stories of the disappearance of salmon.</i>	15	2
20. Do you ever thank the salmon for offering itself to you? Do you ever pray when you catch salmon? Do you make an offering when you catch the first salmon? <i>Positive means individuals give thanks through a prayer and give an offering when the first salmon is caught. Negative means no prayer, offering or other recognition is given with the first salmon catch.</i>	37	0

21. Do you ever hear the elders talk about the salmon having a spirit? <i>Positive means people perceive salmon to have a willful spirit. Negative means people do not perceive salmon to have a willful spirit.</i>	19	3
22. Did you ever hear elders talk about a stream having a spirit or being like it was alive? Do some people still think that way? <i>Positive means people perceive of a stream as having a spirit and being alive. Negative means people do not perceive of a stream as having a spirit and being alive.</i>	7	0
23. Do rivers or streams have events – or stories - associated with them that are good or bad? Is it appropriate to tell any of them now? <i>Positive means there are stories associated with streams that have a moral implication. Negative means there are no stories associated with streams that have a moral implication.</i>	8	0
24. How do people get money to buy boats and motors for subsistence fishing? <i>Positive means people commercially fish in Bristol Bay or engage in other part time employment. Negative means people do not engage in Bristol Bay commercial fishery or other part-time employment.</i>	16	0
25. Do you feel a connection between the way you fish today and the ancestors' way of fishing? <i>Positive means people feel an emotional connection between subsistence fishing today and the subsistence fishing of their ancestors. Negative means people feel no such connection.</i>	8	0
26. Why do you live in your village? <i>Positive means people desired to live in their village and felt an emotional attachment to their lifestyle. Negative means people were ambivalent or disliked living in their village or felt they had no future there.</i>	39	2
27. Is there anything else you'd like to say? Is there any message you'd like to convey to Washington/EPA (Environmental Protection Agency)	N.A.	N.A.
Total	694	18

A. Subsistence

1. Voices of the People

It may be different, the way we gather it nowadays, but it's the same end product. It's the same.
F-69, 9/18/11

If you get out in these outlying villages, about 80-90% of what they eat is what they gather from their front yards. I was in Igiugig this spring. A can of SPAM... Do you know how much a can of SPAM is in Igiugig? Eight dollars for a can of SPAM! ...There are fewer jobs, so subsistence is one of the main cultures and the driving force of the economy within a community. M-60, 9/16/11

Our fish is more important for them. I tell my kids and grandkids with fish they are very rich; without fish you are hungry. This is the important thing all over in Alaska for us. It is very hard out here in the bush. We have to pay double for every food we get, double to get our heating fuel, double for gas, and without gas, we cannot travel. It is very hard in a rural area. In a big city it is easy; you just grab everything from the store, department store. Out here we don't have grocery stores; our grocery store is very expensive. They give us prices that, if you buy one item, you pay for four. So it is very hard for us, but we grow our kids, and you ask us if it is important for us to have fish. We have to have fish every day because the fish is most important. F-48, 8/20/11

For two families we put up in jars 32 cases [of salmon]....that doesn't include frozen stuff. M-60, 9/16/11

e get them [smelt] until freeze-up here. Then, when the river freezes up, people go up and fish through the ice for them with hooks. They seine them up in the lake, too, but you have to catch them at the right time. M-62, 9/16/11

When that first salmon is caught, it is in the news. KDLG [Dillingham radio station]. Everybody knows about it. M-61, 9/16/11

And he still, to this day, goes to fish camp. He gets all excited about fish camp. He's down there getting his net ready, and he still, at 89 years old, still go out and sets his own net, picks his own net, and work on his own fish, because he knows, and he always tells us how important it is to save our fish and salmon for the winter months. F-32, 8/18/11

We would starve if we don't have fish or salmon. In this area we have lived with fish all our lives, from generation to generation. The people that stayed before us and kids that are behind us will be living on fish. Salmon is very important; all kind of.... Without fish we are very poor; we have no food to eat. With fish we are very rich; our stomach is full. That's the way I look at it. F-48, 8/20/11

Salmon is one thing. They make you feel rich because you have something to eat all winter. Smoked salmon, sun-dried spawned-out fish; all of those make you feel good, because you grew up with it, it is in your body. Any subsistence food; what you eat, like him and I [gestures]; we ate it for a long time. M-53, 8/20/11

Salmon is very important to us. I don't think we could live without fish.... I'm seventy-six years old, and I have never been without fish, since I was small. I don't know how I would feel without it. I think I used fish more than meat when I was growing up, because my Grandma raised me, and that's all she could get, was fish, because it's easier to get. She used to help people put up fish for us to have her share in the wintertime. Then she would put up salt fish for us to have in the winter, so we use it year round. F-27, 8/17/11

Minority View Subsistence

We couldn't live like our parents lived, because it doesn't exist anymore. I mean, we could fish and catch fish and stuff like that. You know, nowadays, you can't live on fish like you used to. You can't even get meat like you used to; you can't even go out hunting for moose or caribou. Nothing is here anymore; everything is disappearing. I know, you know [name] could verify too. There used to be so much caribou, we would see them all over the road, all over the lake, everything. F-44, 8/19/11

Like she was saying right now, even with subsistence, we can't live on that. We have to have money to pay for our bills, telephone, our lights, our heat and trash, our toys, water, and sewer. You have to pay so much a month for that. I myself will support any kind of entity that comes and bills for jobs. I don't think subsistence; we love subsistence, but I don't think it is going to last forever,We need money to pay our bills. That is why a lot of people are moving to Anchorage. M-44, 8/19/11

We can't just go out there and get money from nowhere. You know, subsistence is gone in this village [Iliamna] and in Iliamna. Subsistence, we can't live on subsistence anymore. We have car payments to pay, we have Honda payments to pay, and we have our snowmobile payments to pay. How on subsistence; how are you going to pay all of those bills? Some pay \$500 a month

for car payments. How are you going to pay \$500 a month on subsistence? You can't do that anymore; you have to live to make money nowadays for those young kids. M-49, 8/20/11

2. Introduction

In southwest Alaska subsistence is a fundamental non-monetized economic activity of the region and forms the basis of cultural life. Though the economy involves both cash and subsistence sectors, most of the food comes from subsistence activity as indicated in the ADF&G Division of Subsistence data reproduced below. Moreover, cultural and personal identity largely revolves around subsistence. This concept is expressed in a 1988 film by Brink and Brink where Dena'ina leader Fred Bismark highlighted the importance of subsistence when he said, "If they take subsistence away from us, they're taking our life away from us." Two decades later that remains true; Fall et al.(2009:2) wrote, "At the beginning of the 21st century, subsistence activities and values remain a cornerstone of area residents' way of life, a link to the traditions of the past, and one of their bases for survival and prosperity." Bismark's statement and Fall's analysis as well as interview generated "Voices of the People" at the beginning of this section illustrate the idea that subsistence is "life" and the foundation of culture for the Nushagak and Kvichak watershed villages. Everyone who responded to Question 1, Table 9 felt the loss of salmon would impact them negatively and subsistence based on salmon and other wild foods is the cultural foundation for the region.

Subsistence is not a return to practices of earlier centuries but employs modern technology. Nylon nets have replaced spruce-root or sinew nets; aluminum skiffs and four-stroke motors have replaced kayaks or canoes; metal pots have replaced birch-bark or willow baskets; modern clothing has replaced sewn hides and skins; and freezers have replaced underground cold

storage pits. Moreover, subsistence activities follow management practices formulated by the ADF&G, dictating bag limits and seasons. The results of these interviews and ADF&G research cited below confirm that the diet is still largely based on wild foods caught and processed by the people who live in the area; values, such as respecting the salmon and not taking more than you need, among others, are still honored; and the identity of the people is shaped by the subsistence process, just as it was in the past.

As described in the Pre-Contact and History sections (II.), indigenous people in the study area have been harvesting wild resources for at least 12,000 years and have intensively caught salmon for at least 4,000 years. This immense time depth has shaped all aspects of the culture, including social structure, political structure, and religion. Because Dena'ina and Yup'ik are the dominant populations in the study area, and because healthy wild salmon stocks and many other components of their traditional way of life still persist such as language, sharing wild foods and sharing beliefs related to nature, the area has a cultural continuum with the past that is rare in North America. In few places do the same wild foods as their ancestors ate dominate the diet and shape the culture as they do today in the Nushagak and Kvichak watersheds

3. Subsistence in Alaska

The importance of salmon and other wild food resources in the study area is tied to federal and state subsistence legislation. No other state in the United States so broadly grants a subsistence priority to wild foods to indigenous peoples as occurs in Alaska. Both federal and state subsistence legislation apply to Alaska but they differ, and have resulted in two sets of

legislation because of an inherent conflict between federal and state legislation over indigenous rights vs. inherent rights.

Federal subsistence legislation began with the 1971 Alaska Native Claims Settlement Act (ANSCA), which extinguished aboriginal hunting and fishing rights and, in return, charged the Secretary of Interior and State of Alaska to “take any action necessary to protect the subsistence needs of Natives” (La Vine 2010:30-34). The federal subsistence intent of the 1971 ANSCA legislation was clarified in Title VIII of the 1980 Alaska National Interest Lands Conservation Act, (ANILCA). ANILCA recognized the cultural aspect of indigenous subsistence stating: "the opportunity for subsistence uses by rural residents of Alaska...is essential to Native physical, economic, traditional, *and cultural* existence and to non-Native physical, economic, traditional, and social existence (emphasis added)" (La Vine 2010:32). The language describing the importance of subsistence to Native and non-Native rural communities is the same with the only difference that “cultural” importance is included in Native subsistence users’ list of essential rights while that term is not included in the non-Native list of essential rights. That language became the basis for federally recognized indigenous subsistence rights. Federal ANSCA and ANILCA legislation set up a legal conflict between indigenous rights and state law. The “Inherent Rights” clause in Article 1, Section 1 of the Alaska Constitution specifies equal treatment under the law for all Alaskans and makes no provision for indigenous rights. Consequently, subsistence became an important political issue in the early 1970s and remains so today (cf. AFN Federal Priorities, 2011, pp. 1-9).

The State has developed subsistence legislation with the context of the “Inherent Rights” clause cited above. As depicted in the 1988 documentary *Tubughna: The Beach People* by Brink

and Brink, in 1973 Governor William Eagan made a promise to Alaska Native people. Speaking at a meeting in Anchorage, Governor Eagan said:

Let me assure you that the state's commitment to preserving subsistence capability in our fish and game resources is of the first priority and will continue to be. Continuing attention to the Native for maintaining subsistence capability is an integral part of the state's overall fish and game management program. It always has been, is now, and will be so in the future. (Brink and Brink 1988)

That promise was partially realized as law in the 1978 *State of Alaska Subsistence Act*, which provided for a Division of Subsistence within the ADF&G and defined subsistence as “customary and traditional use.” The act also specified a subsistence priority in wild resource allocation over commercial or sport caught resources. The act did not limit subsistence to rural (largely Native) residents and did not recognize indigenous rights; to do so would have been unconstitutional in state law. The act also directed establishment of a Division of Subsistence within the Alaska Department of Fish and Game to “quantify the amount, nutritional value, and extent of dependence on food acquired through subsistence hunting and fishing” (AS 16-05.094) and has resulted in three decades of the most detailed subsistence data collected anywhere in the world, some of which is used in this report.

As a result of over forty years of legislation and adjudication revolving around the “Inherent Rights” issue among stakeholders, a dual management system has emerged. As summarized by La Vine (2010:34) the state now manages fish and game for subsistence purposes on state and private land including regional and village corporation land, while the federal government, through the U.S. Fish and Wildlife Service or cooperative agencies, manages fish and game in federally designated subsistence areas as determined by criteria applied and regularly reviewed by the Federal Subsistence Board. On state lands all citizens are eligible to

harvest fish and game for subsistence purposes but are bound by the customary and traditional use criteria. On rural federal lands only rural residents are eligible to practice subsistence. On non-rural lands subsistence is prohibited. Alaska Natives of the communities of the Kvichak and Nushagak drainage fit both the “customary and traditional” and “rural” criteria and have engaged in subsistence fishing and hunting throughout this time period and will continue to do so as long as they remain rural. Significant non-Native population increases constituting a shift from rural to urban would potentially change subsistence access as has happened, for example, on the Kenai Peninsula where the Dena’ina do not have full subsistence rights because the area is largely determined to be urban.

4. Scope of Subsistence

Table 6 is an indication of the importance of subsistence activities and salmon to the people of the Nushagak and Kvichak River systems. Essentially everyone in every village and town (98% or more of the households) uses wild food subsistence resources, and most (88% to 100% of households) use salmon.

Table 10. Use and Reciprocity of Subsistence Resources. Data from Fall et al. 2009, Krieg et al. 2009, Fall et al. 2005

Community	Year	All Wild Resources; % Households that:			Salmon' % Households that:		
		Used	Gave	Received	Used	Gave	Received
Dillingham	1984	98	62.7	88.2	88.2	34.6	43.8
Ekwok	1987	100	86.2	82.8	89.7	48.3	51.7
Igiugig	2005	100	100	100	100	83.3	83.3
Iliamna	2004	100	53.8	76.9	100	30.8	38.5
Kokhanok	2005	100	82.9	94.3	97.1	62.9	60
Koliganek	2005	100	92.9	89.3	100	60.7	53.6
Levelock	2005	100	85.7	92.9	92.9	35.7	78.6
Newhalen	2004	100	80	96	100	64	32
New Stuyahok	2005	100	73.5	98	89.8	55.1	63.3
Nondalton	2004	100	92.1	97.4	92.1	55.3	63.2
Pedro Bay	2004	100	88.9	100	100	72.2	77.8
Port Alsworth	2004	100	72.7	90.9	100	45.5	54.5

(Recent data collected by Steve Braun and Associates funded by Pebble Limited Partnership for Environmental Impact Statement assessment includes more recent data not available as of this draft.)

The data of Table 10 also indicates reciprocal sharing of wild foods is a fundamental aspect of subsistence culture in the study area. In most villages almost 100% use wild food resources and more than 80% of households receive shared subsistence food resources of some kind. Sharing of salmon is lower than for all resources probably because typically extended family units work together at subsistence fish camps (Fall et al. 2010) and the fish they collectively harvest is not considered to be “shared” as much as “earned” among extended family members. Further research could clarify the matter. Sharing is further discussed in Social Relations section (III. E.3). Table 11 presents subsistence resource data on a per capita basis.

Table 11. Per-Capita Harvest of Subsistence Resources. Data from Data from Fall et al. 2009, Krieg et al. 2009, Fall et al. 2005

Community	Year	Total Harvest Pounds	Estimated Per-Capita Harvest in Pounds						
			All Resource	Salmon	Non-salmon Fish	Land Mammals	Marine Mammals	Freshwater Seals	Beluga
Dillingham	1984	494,486	242	141.4	17.5	65.9	2.97	1.7	0
Ekwok	1987	85,260	797	456.2	68.6	249.2	0	0	0
Igiugig	2005	22,310	542	205.2	59.4	207.8	29.2	7.4	21.9
Iliamna	2004	34,160	469	370.1	34.1	32.7	6.5	6.5	0
Kokhanok	2005	107,645	680	512.8	36.3	95.9	1.7	1.7	0
Koliganek	2005	134,779	899	564.7	90.4	186.2	0	0	0
Levelock	2005	17,871	527	151.8	39.9	257.4	37.7	4.5	33.2
Newhalen	2004	86,607	692	502.2	31.8	104.5	4.4	4.4	0
New Stuyahok	2005	163,927	389	188.3	28.0	143.4	0	0	0
Nondalton	2004	58,686	358	219.4	33.9	81.8	0	0	0
Pedro Bay	2004	21,026	306	250.3	15.3	30	0	0	0
Port Alsworth	2004	14,489	133	89.0	12.0	24.7	0	0	0

(Recent data collected by Steve Braun and Associates funded by Pebble Limited Partnership for Environmental Impact Statement assessment includes more recent data not available as of this draft.)

Table 12 presents the range of some of the important subsistence resources used in the region and their relative importance to each village on a per-capita basis. This data does not include vegetation foods, birds/eggs, and marine invertebrates which are seasonally important, nor does it include salmon retained from commercial fishing. While all subsistence foods are important— particularly for the physical and emotional benefits derived from a varied diet— salmon is, by far, the most important subsistence food ranging up to 82% of the subsistence diet. Land mammals, including moose and caribou among other species, are the second most important form of subsistence food for most villages. Non-salmon fish (northern pike, Dolly

Varden/char, various whitefish, trout, etc.) constitute a third important type of subsistence resource. Subsistence use of marine mammals includes beluga whales, which regularly move up the Kvichak River, and freshwater harbor seals, a unique population that lives year-round in Iliamna Lake. These are significant subsistence resources for the Kvichak River villages of Igiugig and Levelock.

The data indicates as much as 899 pounds of meat is harvested per-capita (Koliganek) and an average of 503 pounds of meat per-capita is harvested per village. According to the U.S. Department of Agriculture's "Agriculture Factbook," in 2000 Americans consumed an average of 277 pounds of meat per year per-capita (USDA Factbook). The difference, of course, is the subsistence data presented here is pounds per-capita harvested, not pounds per-capita consumed. A substantial amount of subsistence-harvested food is shared which partially accounts for such high numbers of per-capita harvest. The numbers are high, however, because the people eat a lot of wild food and subsistence foods are the staple of the culture.

Table 12 Per-Capita Harvest of Salmon Resources. Data from Data from Fall et al. 2009, Krieg et al. 2009, Fall et al. 2005

Community	Year	Total Harvest, Pounds	Per-Capita Subsistence Harvest in Pounds				
			All Wild Resources	All Salmon	King (Chinook)	Red (Sockeye)	Non-Salmon
Dillingham	1984	494,486	242.2	141.4	52.8	38.5	17.5
Ekwok	1987	85,260	796.6	456.2	178.2	160.3	68.6
Igiugig	2005	22,310	542	205.2	5.4	168.0	59.4
Iliamna	2004	34,160	469.4	370.1	0	369.8	34.1
Kokhanok	2005	107,645	679.6	512.8	3.2	480.4	36.3
Koliganek	2005	134,779	898.5	564.7	193.9	192.5	90.4
Levelock	2005	17,871	526.7	151.8	43.1	85.9	39.9
Newhalen	2004	86,607	691.5	502.2	10.1	487.6	31.8
New Stuyahok	2005	163,927	389.2	188.3	112.6	36.3	28.0
Nondalton	2004	58,686	357.7	219.4	0.4	218.9	33.9
Pedro Bay	2004	21,026	305.5	250.3	0	250.2	15.3
Port Alsworth	2004	14,489	132.8	89.0	0.7	87.6	12.0

(Recent data collected by Steve Braun and Associates funded by Pebble Limited Partnership for Environmental Impact Statement assessment includes more recent data not available as of this draft.)

Table 12 breaks down the subsistence harvest of salmon by species. King or Chinook salmon spawn in the Nushagak River but not normally in the Kvichak River and are not harvested in the Newhalen River system. Today, interviewees report most king salmon are fished in camps on the Nushagak River located at Lewis Point near the mouth of the river. Salmon are also taken near the villages (see Section II.B.3). Sockeye, or red, salmon constitute the most important subsistence salmon species in the villages of the Kvichak and Newhalen River drainages and are also taken in significant numbers in the Nushagak River drainage.

5. The Seasonal Subsistence Round

As illustrated in Figure 2, the villages in the Nushagak and Kvichak River drainages have a seasonal subsistence round that involves harvesting wild resources at an optimal time throughout the year. Evanoff (2010:66) and La Vine (Fall et al. 2010) have described the seasonal round for the Kvichak drainage Dena'ina and it is summarized as follows. In the spring, with the return of ducks, geese, and other waterfowl, small groups travel to hunting or egg gathering areas. In addition, villagers also gather early spring plants, such as fiddlehead ferns. In late May and early June, villagers begin harvesting salmon returning to spawn. Some families net salmon near their villages while others travel to fish camp. Subsistence salmon activities occur throughout the summer although many also engage in commercial fishing in Bristol Bay, depleting the fish camp personnel but providing cash to support subsistence activities. Late summer and fall subsistence activities involve berry and plant gathering. In late fall or early winter villagers engage in caribou and/or moose hunting depending on the ADF&G-determined hunting seasons for the specific area. Winter subsistence activities revolve around ice fishing for whitefish and other freshwater species, ptarmigan hunting, wood harvesting to supplement home heating and for steam baths, and trapping of furbearers.

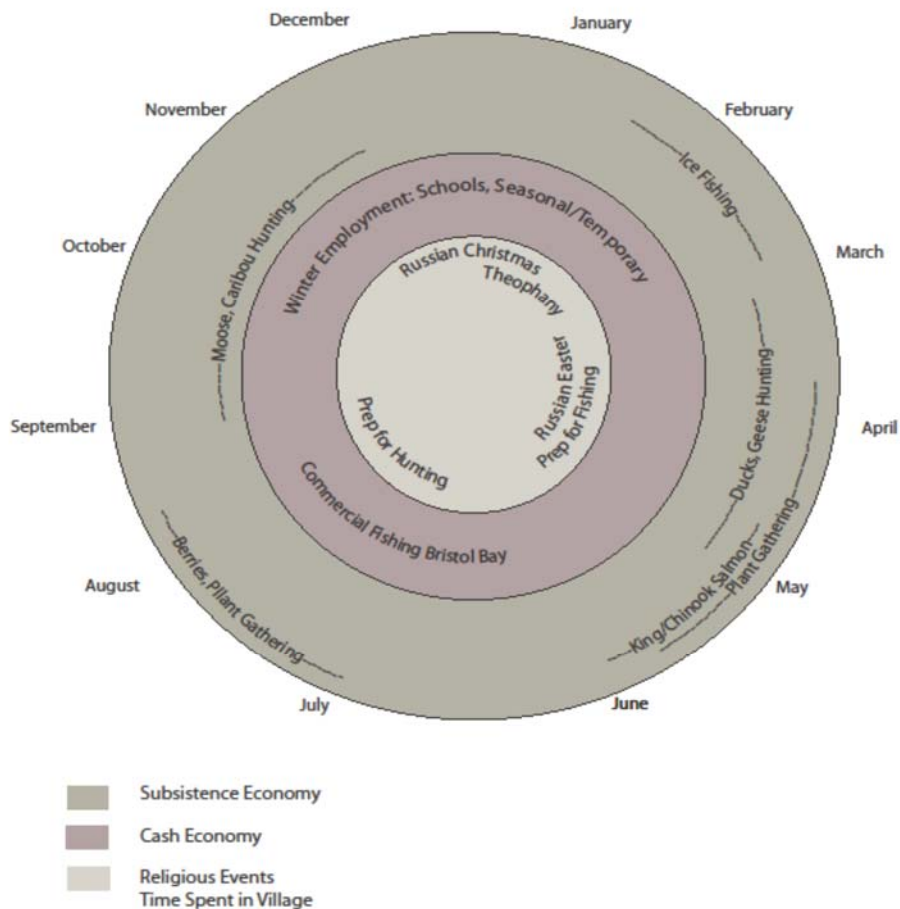


Figure 2. Significant Aspects of the Subsistence Seasonal Round. Modified from Evanoff (2010:66).

6. The Interplay of Subsistence and Wage Income

Interviewees indicate that, for those fully engaged in it, subsistence is a full-time job, but it is necessary to supplement subsistence with cash from part-time wage labor or commercial fishing, to defray the costs of subsistence activities. With gasoline costs presently in the \$6 per gallon range, trips to fish camps and other subsistence areas are expensive. Guns, ammunition,

fishing gear, and modern winter clothing, among other expenses, also add to the subsistence investment. While conducting village interviews, researchers observed that besides having a skiff and motor powerful enough to navigate rivers like the Nushagak, Mulchatna, Newhalen, and Kvichak, most families must also rely on one or more all-terrain vehicles (ATVs) and snowmachines for subsistence, all of which require considerable initial investment and maintenance costs. Rather than being recreational vehicles, these means of transport have become necessary for the longer travel distances required for modern subsistence. During the nineteenth century, dog teams, canoes, kayaks, and foot power via snowshoes or hiking were the primary means of transportation, and people, by necessity, lived in small villages located close to subsistence resources. In contrast, the twentieth-century establishment of trading posts/stores, schools, churches, and health services led to residents consolidating in fewer, larger villages. For example, today, there are only three interior villages on the Nushagak River whereas, in the mid- to late nineteenth century, there were eight (VanStone, 1967:114-115). The result of the consolidation is that village residents must now travel farther to obtain subsistence resources, requiring mechanized transportation to do so, and there is overlap among the range of village subsistence activities.

Interviewees indicate that to deal with these costs, many families reported holding commercial fishing permits and fish the sockeye run in Bristol Bay during late June and into mid-July or engage in other forms of part time employment. Besides providing needed cash, these forms of employment, with their short duration and/or seasonal nature, are ideally suited to provide another ingredient critical to a subsistence lifestyle, time to engage in subsistence activities. Thomas Lonner indicates that in Bristol Bay villages cash is obtained from wage

employment such as working in the commercial fishery (also corporate dividends from membership in Native Corporations and social welfare payments) and states “wage employment is intended to underwrite subsistence equipment; the time, energy, and opportunity cost in wage employment may be seen as an investment in subsistence (Lonner cited in Lowe 2007:40)”.

Table 13 is the number of 2010 Bristol Bay Fishing permit holders and crew member licenses for the study area villages reflecting the major source of cash to support subsistence activity.

Table 13. Commercial Fishing Permit and Crew Member Licenses

	Commercial Permit Holders, 2010	Commercial Crew Member Licenses, 2010	Subsistence Permits, 2007
Dillingham	227	272	n.d
Ekwok	3	5	n.d
Igiugig	4	4	6
Iliamna	15	26	54*
Kokhanok	9	19	29
Koliganek	18	25	n.d
Levelock	6	10	1
Newhalen	11	1	n.d
New Stuyahok	24	43	n.d
Nondalton	6	6	29
Pedro Bay	3	0	19
Port Alsworth	2	4	30
2010 Data from ADF&G Commercial Fisheries Entry Commission. http://www.adfg.alaska.gov/index.cfm?adfg=fishingcommercial.main 2007 Data from Fall et al. , 2009, page 19 <ul style="list-style-type: none"> • Combined data for Iliamna and Newhalen 			

7. Subsistence as an Economic Sector

Labor statistics do not identify subsistence as an employment category because it is not based on wage-labor or a salary and, hence, are unemployed. However, those who choose the subsistence lifestyle work long hours, utilizing considerable skill to provide food for themselves and their families and in interviews described subsistence as a full-time occupation.

Subsistence is dictated by the seasons, is time-consuming and must be understood differently from recreational fishing or hunting. It is not critical if a recreational fisher or hunter misses a season due to work obligations or other demands, but, for many Bristol Bay village residents, subsistence is one's work obligation and employment in the cash economy impinges on the time that is necessary to obtain and process food for a family for a year.

Thornton (1998) writing in the on-line edition of *Cultural Survival Quarterly*, considered Alaska subsistence to be the leading employment sector of rural Alaska because of the number of people engaged in subsistence and the economic benefits derived from harvesting one's own food. Several attempts have been made to measure subsistence economically by monetizing wild food resources. Fall et al. (2009:3) measured the economic importance of subsistence by calculating the cost of replacing wild foods obtained from hunting, fishing, and gathering with similar foods obtained in a market. Their published data indicates the average annual per-capita harvest of wild foods in the villages of the Nushagak and Kvichak River drainages is 304 pounds of salmon, 123 pounds of land mammals (mostly moose and caribou), 39 pounds of other fish, 23 pounds of plants and fungi (mostly berries), 9 pounds of marine mammals (freshwater seals and beluga whales), 8 pounds of birds and eggs, and one pound of marine invertebrates (mostly clams). To supplement their subsistence harvest, households in the Nushagak and Kvichak River drainages spend 15 to 26% of their annual cash income on store-

bought food (Fall et al., 2009:3). In the ten villages for which there is recent data (i.e., excluding Dillingham and Ekwok), the annual per-capita cost of purchasing food ranged from \$1,467 to \$2,622. At 2004 prices (when the initial analysis was done), the annual replacement cost for the average subsistence harvest described above would be an additional \$7,000 per capita, which would increase the demands on the annual cash income an average of nearly 80% ranging from 23% for Port Alsworth to 157% for Koliganek. As high as they are, the estimate may be an under-representation of the estimated worth of subsistence resources. With rising food prices, the replacement value would be significantly higher today. King salmon fillets, for example were \$17/pound on December 30, 2010 at 10th and M Seafoods, Anchorage, Alaska. The replacement value of 193 pounds of king salmon for Koliganak, for example, would be \$3281 per-capita.

While monetizing subsistence gives a measure of its importance to the economy, these values do not reflect the fact that the people of the region unanimously reject replacing their traditional subsistence foods with farmed fish or other imported products, based on the belief that such products would be of inferior quality and that doing so would result in cultural degradation, (see Section III.C.6) for a discussion of the importance of wild salmon from one's home river.).

8. Subsistence and “Wealth”

In Alaska many non-Native people perceive subsistence as an activity for impoverished, unemployed rural people who live in employment-poor communities and cannot afford to buy food, so they have to hunt and fish for it. Thornton (1998) asserts that this perception relates to the “minimum (as of food and shelter) necessary to support life” dictionary definition of subsistence and has given rise to the “subsistence-as-welfare” concept and associated negative implications. The Yup’ik and Dena’ina perceive subsistence quite differently. X number of interviewees spoke of the cultural value of subsistence as a chosen lifestyle. As indicated in 2011 interviews subsistence is a lifestyle chosen by both old and young. Subsistence is a job, in which the wages are healthy wild foods and the benefits include not only vigorous outdoor activity shared with friends and family, but also a large measure of self-determination supported by a community of like-minded people. Subsistence is coterminous with culture, and the entire range of social and spiritual activities that “culture” implies. Consistently, the Yup’ik and Dena’ina communities of the Nushagak and Kvichak River drainages define a “wealthy person” as one with food in the freezer and the freedom to pursue a subsistence way of life in the manner of their ancestors (see Social Relations). Their ability to continue their reliance on subsistence and their concept of wealth has contributed to the maintenance of vital and viable cultures for the last 4000 years.

B. Physical and Mental Well-being: the Role of Subsistence

1. Voices of the People

We crave it [salmon] when we don't have it. We just need it. F-30, 8/17/11

You know, it's got that one oil in it that is a cancer-fighting oil, and it's really good. F-38, 8/18/11

I think it [salmon] is healthier than probably beef or pork or something like that. M-68, 9/18/11

Yes, to be healthy, like I say, if we don't eat fish we won't have anything to eat. That is our health. F-48, 8/20/11

When you are eating fish...you get a drink of water to flush yourself out. If you don't eat fish, you will starve. You got to flush yourself out with water every day; that is what your health is about. God put us on this earth to eat fish every day. That's what it is. Without fish, like I said, we are hungry; with fish we are full. F-48, 8/20/11

We have...to live healthy to be free from diseases if we eat healthy food. Not breathe air that's no good or drink water that is no good; it will affect your whole body. So, on the subsistence, I say let's protect Mother Earth; I demand it. If we don't protect Mother Earth, we are gone. M-51, 8/20/11

We don't buy meat very much. Salmon is our most important dish. F-27, 8/17/11

Salmon is a really an important part of our diet. I think it has things that meat does not have. You are always hearing things about fish oils and how healthy [they are], but we already have that, so we must be healthy. F-34, 8/18/11

We can't live without salmon. We'll be missing something. F-27, 8/17/11

Well, we grew up with it. We need it. If we don't have it, we miss it. I can't see anybody that lives around here without it. F-30, 8/17/11c.

I've seen kids teethe on smoked salmon strips. They're hard. They get all fishy and smelly, but man, they just chew. It's better than the rubber toy. F-38, 8/18/11

...[salmon] is one of our healthiest foods we can give to our child.... It is really healthy. F-69, 9/18/11

To me, I think eating salmon has sustained our ways of life. I think by eating a lot of salmon, we are a healthy, healthy Dena'ina. I always tell children there at potlaches or wherever; I say that, "If you eat this piece of fish you're going to be a smart Dena'ina woman, you might be able to be a lawyer or a doctor." It's surprising that, just by telling them that, they...eat it, and they will say, "Oh, taste good." F-32, 8/18/11

When my kids grew up, I mostly gave them fish and moose meat. F-44, 8/19/11

I definitely limit my child; you know, the fast foods, we eat it once a week, sometimes more... [They eat] moose meat, the fish...berries, and wild plants as well... We want to give to our children the fish and we want to keep the water clean for them. It was a gift to us from our ancestors, which will then be given to our children. F-69, 9/18/11

The school system here does get volunteers who donate fish to the schools. Prior to that they used to order cod fish and other fish from out of the area. M-61, 9/16/11 The kids didn't like it. M-60, 9/16/11 Not from here. They finally started the donation program, and the fishermen stepped up to the plate and said, "Yes, definitely." The crew members didn't balk. There were no qualms whatsoever about donating fish to the schools. M-61-9/16/11 It is the best hot lunch program we have; the kids just love it when they have salmon day. M-60, 9/16/11

Yes, and that it is healthy [wild salmon]...and something they [Yup'ik] wouldn't have without But if we ever lose it, then we won't have anything at all. M-68, 9/18/11

I think it would matter[that the salmon be wild]; that would be our concern. We like to take our wild natural renewable resource salmon rather than farmed salmon because you never know what they've been eating. M-26, 5/19/11

Wild salmon is more important for us, or wild fish. I don't believe in farmed fish, because wild fish is better for all our health. It has all natural oil, and we don't paint it with artificial paint like the farmed fish you get. You can sell your farmed fish all you want, but wild salmon is more important to us. F-48, 8/20/11

...people from Kenai or Anchorage, they can go to Kenai and get their salmon, but they always say there's nothing like the lake salmon. There's nothing like salmon that comes from Sixmile Lake. We hear that all over.... I always try other people's fish, but there's nothing like salmon from our own stream, salmon from the lake that comes up. Well, I guess we're spoiled having our own. F-32, 8/18/11

There is nothing better than wild salmon...I have talked to many people all over the state, and the best salmon comes from this area, Bristol Bay. M-29, 8/17/11

One year we got a farmed salmon.... What a difference! It came in with the usual run, and it was salmon that was raised in the University of Washington [salmon farm]. They have a big place out there in Seattle. We went in there, and they had a lot of fish. The meat was soft, and the skin was not firm and scaly. I remember, my daughter was cleaning salmon that year, and she said, "Where'd this fish come from? It looks like a salmon, but it's terrible." It was soft. It wasn't like a wild salmon. F-38, 8/18/11

2. Introduction

As described in Section II.A.3., archaeological evidence indicates that salmon were an important component of the diet of the probable genetic ancestors of the Yup'ik and Dena'ina, who left evidence of their presence in this region up to 4,000 years ago. These genetic ancestors of the present day Yup'ik had an important component of salmon in their diet as long as 4000 years ago, according to the archaeological record (see pre-contact section). The Dena'ina track back to the Paleo-Arctic tradition, as old as 10,000 years ago, although evidence for intensive salmon utilization does not occur until A.D. 1000.

Based on studies of other populations, there is a strong possibility that, within their long history, the Yup'ik may have become genetically adapted to eating salmon. Several recent studies have shown that physical adaptation and evolution based on dietary factors (e.g., lactose intolerance) can occur in 3,000 years or less (Tishkoff, et al., 2007; Bersaglieri et al., 2004; Hollox et al., 2002). Other studies are demonstrating genetic changes at the population level in humans in a similarly short time frame based on adaptation to environmental stressors such as living at high altitudes in Tibet (Peng et al., 2010 :1075-1081; Xin et al., 2010: 75; Simonsen et al., 2010: 72-74).

The National Science Foundation recently funded a University of Alaska study to assess the differences between Yup'ik and other populations in drug metabolism, as well as in vulnerability to metabolic syndrome (development of risk factors for coronary disease, stroke, and diabetes). This study will consider the relevance of dietary differences and resulting long-term physical adaptation, including genetic adaptation. In a separate study, researchers from the Center for Alaska Native Health Research (CANHR) are assessing how a subsistence diet affects the vulnerability of Yup'ik people to disease (O'Brien et al., 2011). In a 2009 study whose results strongly support the validity of red blood cell deltaN as a biomarker of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), the researchers state, "the omega-3 (n-3) fatty acids derived from fish, eicosapentaenoic acid (EPA; 20:5n-3) and docosahexaenoic acid (DHA; 22:6n-3) are associated with a reduced risk of cardiovascular disease and other chronic diseases (O'Brien *et al*, 2009:913).

While the amounts of salmon and other fish consumed varies from village to village, and from one season to the next, the demonstrated importance of these foods in the diet is consistent with what the traditional knowledge shared by Yup'ik elders and culture bearers, as presented above. As discussed below, the salmon-dependent diet of the Yup'ik and Dena'ina benefits their physical and mental well-being in multiple ways, as well as encouraging high levels of fitness based on practices involved in subsistence activities.

3. Nutrition

The dietary habits of Yup'ik and Dena'ina living in the villages of the Bristol Bay region shows regular dependence on several species of wild salmon, which they sometimes consume several times a day as the interviews attest. Yup'ik and Dena'ina prepare and eat all five species of

Pacific wild salmon in different ways, including fresh, salted, pickled, canned, dried, and smoked. Salmon and other traditional wild foods comprise a large part of the villagers' daily diet throughout their lives, beginning as soon as they are old enough to eat solid food (Interviews, 2011). For example, one Yup'ik father told researchers he gives his son salmon strips with his breakfast, so he will think better in school (Interview New Stuyahok May 2011). Elders interviewed at the elders' conference in New Stuyahok (May 2011) indicated that they receive salmon and other subsistence foods from their children, other relatives and neighbors on a regular basis.

In addition to salmon, villagers also regularly consume other wild fish species, such as humpback whitefish, Arctic char/Dolly Varden, Arctic grayling, rainbow trout, and northern pike, the wild ungulates caribou and moose, and, to a smaller extent other mammals, birds, and bird eggs. Wild plants, including blueberries, crowberries, salmonberries, ferns, and other species, add fiber, vitamins, and minerals (Interviews; P. Kari 1995). The Yup'ik and Dena'ina continue to harvest certain plants with medicinal values. It is important to recognize that in addition to providing a wide range of valuable nutrients and protein sources, the subsistence diet works year round to provide a workable harvest schedule with adequate time for preparation and storage.

While subsistence technologies have changed and are now supported in part by the cash economy that commercial fishing provides, enabling purchases of snow machines, rifles and other equipment, the basic subsistence seasonal schedule has been approximately the same for hundreds and probably thousands of years. The implications for population sustainability within the environment, and co-evolution of the human population with environmental food availability

mean that hypotheses about the risks of significant changes to the salmon population are important, and change in dependence on local wild salmon could have far-reaching impacts on Yup'ik and Dena'ina physical and psychological health, including at the genetic level.

Villagers in the study area also eat store-bought foods, but do not prefer them (Interviews 2011). Like other northern subsistence cultures, the Yup'ik and Dena'ina consider their traditional foods to be healthful and satisfying, in addition to providing strength, warmth, and energy in ways that store-bought food does not (Hopkins, 2007: 42-50). Hopkins' study on health and aging also provides an insight into women's views of the importance of the subsistence diet. Eating subsistence foods was an overwhelming theme among all participants.. They generally viewed market or *kass'aq* (white person) food as unhealthful (Hopkins, 2007:46). Hopkins quotes one of the participants, describing the importance of the subsistence diet for elders: "In years back, before I was born, I know there were elders that were very healthy and strong because they have their food, their native food, not mixed up with the *kass'aq* food. Although they have a hard life, they were healthy, strong, because of their native food. Seal oil, dried fish (Hopkins 2007).

4. Fitness

Yup'ik and Dena'ina dependence on subsistence foods has the additional health benefit of providing opportunities and incentive for physical fitness, since engaging in subsistence harvesting improves fitness and fitness, in turn, enhances the efficiency of subsistence harvesting. Subsistence hunting, fishing, and gathering demands stamina to endure long periods of physical activity and strength to handle meat, large quantities of fish and heavy fishing gear . Hopkins (2007: 45-46) quotes from the response of one study participant, over sixty years of age:

“I think today most of the women are healthy for activity, physical activities. When they go berry picking, they’re working using their bodies everything. When we are cutting fish, we are using everything, our muscles, lifting things.”

The fitness needed for and resulting from subsistence is part of other aspects of village life, as well. Throughout the winter the Yup’ik villagers, from youth to middle-aged, play basketball and other sports regularly, competing in vigorous games. Researchers watched in New Stuyahok as a team of middle-aged men defeated a youth team in an intense, hour-and-a-half game, then went to church services for an hour and returned to play another game of equal length. In several Yup’ik villages, including New Stuyahok, the physical activity of traditional dancing, is making a comeback. As described in Section III.E., this cultural activity is based on dance as story-telling, which both values and elaborates on traditional cultural practices, such as fishing.

While in New Stuyahok, researchers observed that elders, including the oldest present, at around age 86, frequently walked to locations within the village. According to Hopkins, walking was the primary physical exercise identified in that study’s interviews. “The participants referred to walking as an important component of health, both physical health and mental well-being.

Walking is believed to keep the body strong, promote energy, and is a basic physical activity in gathering subsistence foods” (Hopkins 2007: 46).

The apparent overall fitness of the village population in New Stuyahok gave researchers present at the Elders’ Conference the impression of frequent exercise, and led to the hypothesis that the practices of subsistence food gathering, in addition to the food itself, create higher levels of fitness, and act to prevent and reduce health risks from more sedentary lifestyles. For Alaska

Natives, as for other Native Americans, the high risk of diabetes and subsequent health consequences is serious enough to make the hypothesis an important one to test.

5. Disease Prevention

Beyond the Yup'iks' own personal conceptions and cultural knowledge about the importance of wild foods in their diets, many studies also confirm the remarkable health benefits of omega-3 fatty acids and the other nutrients found in high percentages in subsistence foods such as wild salmon, and the combination of salmon, wild greens, blueberries and other berries for preventive health among the Yup'ik. These studies particularly underscore the importance of salmon-rich diets for the prevention of maladies, including cardiovascular diseases and type 2 diabetes. A 2009 study, for example, concluded that "the omega-3... fatty acids derived from fish...are associated with a reduced risk of cardiovascular disease and other chronic diseases" (O'Brien et al., 2009:913).

In a cohort study of Yup'ik from the Yukon-Kuskokwim area (Boyer et al., 2007:2535-2540), the CANHR found that metabolic syndrome is uncommon in that population relative to others, occurring at a prevalence of 14.7% in the study population, compared to 23.9% in the general U.S. adult population. The study population also had significantly higher high-density lipoprotein (HDL) cholesterol levels and lower triglyceride levels than the general U.S. adult population.

In another related study of the same population, the Fred Hutchinson Cancer Research Center, in collaboration with the CANHR, found that Yup'ik Eskimos, who consume 20 times more omega-3 fatty acids from fish than the average American, display a much lower risk of obesity-related disease, despite having a similar rate of overweight and obesity (Makhoul et al., 2011). In referring to the study, lead author, Dr. Zeina Makhoul, said:

Because Yup'ik Eskimos have a traditional diet that includes large amounts of fatty fish and have a prevalence of overweight or obesity that is similar to that of the general U.S. population, this offered a unique opportunity to study whether omega-3 fats change the association between obesity and chronic disease risk.... It appeared that high intakes of omega-3-rich seafood protected Yup'ik Eskimos from some of the harmful effects of obesity.... While genetic, lifestyle, and dietary factors may account for this difference, it is reasonable to ask, based on our findings, whether the lower prevalence of diabetes in this population might be attributed, at least in part, to their high consumption of omega 3-rich fish (Quoted in Woodward 2011).

Compounds derived from their subsistence diet, including omega-3 fats from wild salmon consumption, may also benefit mental health in Yup'ik populations. Lesperance et al. (2010), for instance, reports that omega-3 fats can help prevent depression. Another study showed greater improvement in symptoms for patients with chronic depression who consumed omega-3 fats with their medication, compared to those receiving only a placebo with their medication. According to Nemets et al. (2006) "After four weeks, six of 10 patients receiving E-EPA -- but only one of 10 receiving placebo -- had significantly reduced symptoms of depression"

Other subsistence foods, such as wild greens have nutritional elements associated with better mental health, including folic acid and Vitamins A and C. Other factors associated with a subsistence lifestyle, including time spent outdoors and the physical fitness resulting from

subsistence activities, may also benefit mental health. It is interesting to note that several elder interviewees (Interviews 2011) said that, 20 years ago, no one in their villages knew anything about Alzheimer's disease; it was not an illness they had seen before, but it is appearing now.

6. Local Wild Fish

The Yup'ik population of Bristol Bay Region has an interdependent relationship both ecologically and nutritionally, and possibly evolutionarily, with the local wild salmon populations. While they may eat salmon from elsewhere, including farmed salmon, it is clear that the benefits, and particularly the long term fit between the human and fish populations, depends upon maintaining the local wild salmon for subsistence fishing.

While it would be easy to assume that any salmon would provide a similar quantity and quality of omega-3 fats, a Norwegian study showed that farmed salmon, fed a typical farmed salmon diet, did not have the omega-3 fats in beneficial quantities, in contrast to the wild salmon which did (Sincan, 2011).

It is important to underline that if a human population has adapted to particular environmental dietary elements with a genetic modification in their population, that modification is based on a relationship to the genetics of specific regional species, and subspecies. The fit between environment and population may not be transferable to other places.

Thus the elements of the subsistence diet, in particular wild salmon, provide several substantial health and fitness benefits to the Yup'ik of the Bristol Bay region. According to recent studies at CANHR led by Andrea Bersamin, "Diets emphasizing traditional Alaskan Native foods were associated with a fatty acid profile promoting greater cardiovascular health than diets emphasizing Western foods." (Bersamin et al., 2008: 266). The loss of the local wild

salmon as a large component of the Yup'ik diet would result in risks to the physical and psychological health of the population, including greater risks of cardiovascular disease, type II diabetes, and depression.

C. Traditional Ecological Knowledge

1. Voices of the People

But, I think, when they're spawning, that's where they hit the spring waters, where it doesn't freeze. It's always open, even in the dead of the winter. It's always open; you got to be careful there. Especially up in Lake Clark, around Kijik. It's, man, 30 below zero, and it's still open water. M-29, 8/17/11

Our societies are not different than other societies we have special people that know fishing inside and out, we have people in our society that know weather inside out, that know plants inside out, and that know animals inside out. M-61, 9/16/11

...they drop last year's fish in the middle of the river and we do the same thing here. We put king salmon remains on a string tied to a rock and go out with a boat to the middle of the river and let it sink. That makes king salmon go on both sides [near the banks where they can be netted with set nets.] M-26, 5/19/11

When the fish first come up here we don't put our nets out here before a bunch of them go by for the people who live at the end of the river up in Nondalton and all those guys. They start calling up then maybe middle of July [to tell us they have fish, and then] we start putting our nets out. We just kind of watch the salmon go by for the people who live upstream from us. M-54, 8/20/11

They [the fish] are like us, when we want to know something we ask. The fish are the same way. As we were talking about earlier he mentioned that the fish have souls. Every living creature has a soul. All the animals have souls. They are sensitive, very sensitive. If you put something bad in the water the fish will sense it. They will probably not go up the river, they will go somewhere else. If they spawn here and they notice something different they will move to another spot. The fish are very sensitive. M-20, 5/18/11

2. Introduction

Anthropologists and other scientists have used different terms to describe the knowledge of indigenous peoples, including “cultural knowledge,” “indigenous knowledge,” “traditional knowledge,” and “local knowledge” (Berkes 1999:8). Dr. Fikret Berkes and others working in this area of ethnosience use the term, “traditional ecological knowledge” or TEK. Berkes defines TEK as “a cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship

of living beings (including humans) with one another and with their environment” (Berkes, 1999:8). TEK, as Berkes describes it, includes spirituality and social relations, as well as a wide range of cultural beliefs and behaviors related to surviving in a particular landscape, because of the holistic nature of culture itself.

Early studies of TEK depended on comparisons between taxonomies and species lists drawn up by Western scientists and those created by indigenous peoples (Knott, 1998). More recently, however, it has become clear to anthropologists, geographers, biologists, and others working with indigenous peoples that their knowledge is far more ecological in scope and requires more than species lists to document. Therefore, a number of scientists working with indigenous peoples have come up with a diverse range of tools to collect and document indigenous knowledge. These research tools include, but are not limited to:

- Maps of local hunting, fishing, and gathering areas
- Maps of sacred sites and other special use areas
- Traditional Place Names mapping
- Species lists
- Collection of stories, songs, and dances of interactions between animals, humans and other species, humans and the natural environment, or allegorical animal stories
- Studies of subsistence technologies
- Animal life histories and their interactions with other plant and animal species including humans, told as information by locals
- Plant life histories and their interactions with other plant and animal species, including humans, told as information

- Stories of human mistakes made, and lessons learned, about interactions with nature and the environment, including storms, earthquakes, floods, ice, glaciers, changes in nature
- Advice in the form of rules, proscriptions against certain behaviors, prescriptions for other behaviors, and guidelines for management of animal and plant harvests
- Uses for animal and plant species, including recipes for foods and medicines
- Observations shared, often about the complex interactions and ecological relationships in the landscape where the people live, hunt, fish, and gather.
- Local descriptions of long term trends for species numbers and migration patterns, weather patterns, climate, and other natural events
- Linguistic, biological, and archaeological evidence.
- And finally, at a broader level, the values, beliefs, social systems and spiritual practices that have developed over thousands of years through the cumulative application of TEK.

It requires months and years of patient work with indigenous groups to elicit and document in-depth TEK. Researchers must spend adequate time in the field to understand the landscape and local ecosystems as well as the local cultures. More important, local people need time to develop trust in the researchers' methods and personal qualities before they will be willing to share such important confidential knowledge as hunting sites or favorite fishing locations. Fortunately, while the months afforded to this project were not sufficient to develop new in-depth TEK studies with local populations in the villages, there are several existing studies, both in the Nushagak and Kvichak River watersheds, and in the Lake Clark and Iliamna Lake area, that cover TEK in great detail. Among the Nushagak studies is one by the Nushagak-Mulchatna Watershed Council (NMWC) (2007) and among the Kvichak studies are those by

Stickman et al. (2003) and Fall et al. (2010). These long-term studies have focused on the Yup'ik and Dena'ina TEK in the Bristol Bay region and have provided sufficient information for our Bristol Bay TEK assessment, which we summarize in Sections a through c below.

To supplement those long-term studies, we focused interview sessions on the broader levels of TEK, including the values, beliefs, social systems, and spiritual practices of the Yup'ik and Dena'ina that have developed over thousands of years through their cumulative application of TEK. During those sessions we learned much from the elders and culture bearers about TEK and the cultures as a whole. We also heard some specific examples of ecological insights, prescriptions and proscriptions, and management guidelines for several species.

a. Nushagak-Mulchatna Watershed Conservation Plan

Over a two-year period in [dates unspecified], the NMWC conducted interviews with elders, residents, and others who use the watershed to create a database of the TEK of the area (NMWC 2007:3). The NMWC used the data to create an overall plan for protecting the waters and natural resources of the watershed. The interviews helped with the development of maps to identify areas critical to protection of subsistence resources and habitat. The plan identified 12 fish, 6 mammal, and 12 bird species important for subsistence and mapped 125 traditional use areas and 153 traditional area names. The flora and fauna considered most integral to traditional subsistence use were all five species of Pacific salmon, whitefish, winter freshwater fish, moose, caribou, waterfowl, and edible and medicinal plants (NMWC, 2007:19).

The study also identified probable threats to the watershed in the next fifty years, and developed four strategic actions:

1. Reserve adequate water flow for the Nushagak River and tributaries under existing laws for in-stream flow reservation.
2. Maintain the vegetative complex that supports moose, fish and other species within and adjacent to the floodplain.
3. Maintain water quality standards that protect wild salmon and other fish.
4. Prevent habitat damage that could result from mining. (Nushagak-Mulchatna Watershed Council, 2007:3)

What is at stake includes habitat, and wildlife including terrestrial mammals, birds, fish, and the subsistence way of life, along with the unique cultures it supports.

“The Nushagak River system is the fifth largest river in Alaska by volume of water discharged. The drainage supports at least 13 anadromous species, 16 resident species, and four species of fish restricted to estuaries. The Nushagak River and its tributaries host five species of Pacific salmon and provide significant habitat for Bristol Bay sockeye salmon – the largest run in the world. The Nushagak river hosts the largest sport fishery for Chinook salmon in the United States, with the third-largest Chinook run in the country. In addition there are significant numbers of rainbow trout, grayling, Arctic char, Dolly Varden, northern pike, lake trout, and non-game species. (NMWC, 2007., p.8)

The flora and fauna considered most integral to traditional subsistence use includes the following. Fish: 1. Sockeye, Chinook, and Coho salmon; 2. Pink and Chum Salmon; 3. Whitefish; 4. Winter Freshwater Fish. Mammals: 5. Moose; 6. Caribou. Other: 7. Waterfowl; and 8. Edible and Medicinal plants. The elders and other knowledgeable individuals also identified critical habitat for the species of concern and their harvest locations. The Conservation Plan used this information to delineate the watershed into conservation target areas, in terms of habitat types important for traditional use species (NMWC, 2007, p. 20).

Salmon are the keystone species in the region, and provide enormous amounts of marine derived nutrients to the ecosystems described above.

Interviewees identified potential threats to the area including recreation, recreational subdivisions, commercial lodge development, community development, mining, roads, oil and gas, and habitat shifting and alteration.

“Roads are a constant concern because they must often cross anadromous streams and extensive wetlands. Road crossings have the potential, if poorly constructed and maintained, of blocking or disrupting the migration routes of salmon and other fish. Roads can also foul salmon spawning and rearing areas. Major road construction in the region would most likely follow the development of mines.” (NMWC, 2007, p. 31).

In addition to ordinary road construction and uses, the impacts of earthquakes and other natural disasters on the roads and their stream crossings must be considered. Pedro Bay, where the road for the proposed mining district would go through, has historical earthquake activity that is significantly above the Alaska State average and 1603% greater than the overall U.S. average (www.city-data.com, accessed October 14, 2011). Interviewees in Pedro Bay during the fall of 2011 confirmed the high earthquake activity and expressed concerns about new road construction and its potential impacts on their streams and community, based on their long term ecological knowledge

b. K'ezghlegh: Nondalton Traditional Ecological Knowledge of Freshwater Fish

This study, based on interviews with 18 Nondalton residents in 2001, focused on their current and past subsistence use of sockeye salmon and other fish in the Lake Clark/Newhalen River drainage (Stickman et al. 2003: 8). Questions related to fishing practices, geographic locations, and Dena'ina place names. The questions were presented in semi-directed interviews, with USGS quad maps of the Lake Clark Newhalen River area. Answers revealed

that the summer months, from mid-June through August, are traditionally devoted to harvesting sockeye salmon that are returning to Sixmile Lake and Lake Clark. Fish camps used to be set up around the outlet of Kijik Lake, but now are primarily at the outlet of Sixmile Lake and along the shores of the Newhalen River, Sixmile Lake and Lake Clark (Stickman et al., 2003:11).

The interviewees listed nearly a dozen places as the most important locations for sockeye fishing and eighteen as primary locations for harvesting spawned-out sockeye or “redfish.” Residents described in detail how and where they get salmon, listed 36 separate places where sockeye spawn, and gave descriptions of several areas where they have noticed reduced spawning activity, particularly Kijik Lake, which used to be well known as a very productive area. This area in particular has reduced spawning activity due to beaver dams that seem to be blocking the entry of the salmon into the Kijik River, and preventing fish from moving upstream to spawning grounds in and around Kijik Lake. The study also asked about harvest methods and detailed the use of seines, spears, and fish traps. Seining is no longer allowed under State of Alaska fishing regulations and fish traps were banned in 1959. People do use commercially manufactured gill nets.

It was important to the residents that they were respectful of the fish and cared for them. “Everyone interviewed reported that they generally stop fishing once they have caught the number of fish they need” (Stickman et al., 2003:23). Residents also disapproved of people leaving their nets out too long unattended. Andrew Balluta, one of the residents interviewed, said, “They used to say if you don’t use what you are catching in your net, don’t leave your net out there” (Stickman et al., 2003:24). The study also elicited descriptions of putting up fish.

The remaining sections of this report document residents' comments about change: observed change in salmon over time, observed environment changes, human-induced change; and finally the importance of salmon to the population as documented in the observance of the fish camps and the First Salmon Ceremony. A separate section documents the use of other freshwater fish, including rainbow trout, Dolly Varden, whitefish, grayling, northern pike, burbot, candlefish, sucker, and lake trout, and their relative abundance. Residents also noted significant changes in the number of fish returning in the five to ten years prior to the 2003 report. "Each person interviewed reported fewer fish than in the past, and all indicated that they first noticed the change in abundance between five and ten years ago." (Stickman, 2003:26). While Stickman et al. describe numerous possible reasons for the reductions in numbers, as well as changes in timing of the runs, the report also noted that flows in the Newhalen River in 2001 exceeded the level observed to prevent or delay sockeye migration into the lower river (Stickman et al., 2003:27-28 citing C. Woody).

Evenoff (2010) has completed an extensive Dena'ina place names study with maps for the region around Nondalton and Lake Clark National Park and Preserve.

c. Tanaina Plantlore: Dena'ina K'et'una

Priscilla Russell Kari's study of Dena'ina (also known as Tanaina) plant lore describes the seasonal cycle in the Dena'ina use of plants, as well as detailing the gathering, processing, and preserving of the most important plants (P. Kari, 1995). She also covers Dena'ina beliefs concerning plants and the Dena'ina plant classification system. Her study, based on long-term work in several Dena'ina communities, with a wide range of Dena'ina women, documents more than 150 plants that the Dena'ina depend on for foods, medicines, and other uses (P. Kari, 1995).

D. Social Relations

1. Voices of the People

I feel good, proud [to share]. And when our friends give us back, way proud. M-60, 9/16/11

We share with the elders first, then with family. Usually how I do it, if someone goes with me we go 50-50 and he can decide who to share his fish with, and we do the same. It's not decided by one person, usually me and my wife decide. M-26, 5/19/11

It makes me feel good when I give salmon to somebody. F-47, 8/20/11

It makes you feel good inside because you are sharing. M-53, 8/20/11

It's a good feeling, because we know other people want it. It's a good thing to give away, it's healthy. F-30, 8/17/11

Oh, it makes you really feel good [to give salmon], because I know we enjoy it, and people that can't get it that were almost raised on it.... That's just the way the whole village is; they share. F-38, 8/18/11

In our culture here you share with everybody. When I got my first moose, I had to give it to people; when my grandson got his first moose, you give it to people. You share it. That is one thing good about the community of Bristol Bay; we still hold on to our cultural values really strong. Sharing is a very important component to our culture. If somebody is handicapped and unable to provide for themselves, you find some Young Turk or young family to go help them out. You don't expect pay. M-60, 9/16/11

You know, I was having a hard time, and her husband [gestures] brought me a whole truckload of food, and I damn near cried.... Now, when somebody needs help, we do the same thing. If someone needs help, I try to help as much as I can; we always share. When we give something, it feels good, and when we are having hard times and get something, it feels good. M-43, 8/19/11

[Reference to a woman's] mom was blind, and she couldn't do certain things, so my mom always made sure she shared with her. That is one of the things she told me about sharing. She thought it was good to share with people who couldn't do things for themselves. But, she was always doing nice things for us, too. She [the blind woman] made us string to hang fish and things like that. She was really a nice person, her mom. F-44, 8/19/11

Yeah, we always share. Holidays, we share, and if somebody passes away, after burial we have a potlatch; we share. We share with people; that is the way we are brought up. F-41, 8/19/11

We share with people here and in Anchorage.... I like to go fishing, so if we run out of freezer space, I will ask people [who can't fish in the village, e.g. elders] if they want fish, then I'll go out and catch some fish if they want. M-70, 9/18/11

Me, I share it with my younger sisters who never do subsistence. Like, some can't work anymore. They [gesture] share it with their parents. Me, I share it with my younger sisters or my son, my kin. F-23, 5/18/11

Me and my daughter always share after we fish for all summer, but she always tries to give me lots more, but I say, "No, you've got more kids." Sometimes we give [fish to] our daughter-in-law. F-22, 5/18/11

I think, with us, during potlatch times, during hard times or Russian Christmas, or, if we gather together, everybody brings out their dry fish or their jarred fish or their salt fish. Nobody goes hungry; there's always sharing. We would be greedy if we kept it all to ourselves, but there's always a sense of sharing with the community or sharing with relatives. F-32, 8/18/11

The people up there [Kvichak River villages in the 1990s] were not meeting their subsistence needs. They weren't screaming about the cost of gas or the price of lights. They were screaming that they didn't have fish. There were people from over here that were shipping fish over there for people to meet their subsistence needs. M-60, 9/16/11

You are a very rich person if you share. If you don't share, you are nobody.... I have to go share food with my grandkids, great grandkids; it doesn't matter. I don't care if someone comes in and eats with us; I like to share. That's the way we were brought up. Anybody that is in the house, come and eat with us; you are welcome. F-46, 8/20/11

You know, when I was working down in Seattle, my mom used to send me pieces of dried fish all the time. You know, that mail was slow back then. When I would get it, man, it was just like candy. No, but one time she sent me mixed berries. You make it with lard; we call it "agutak." She sent me those, and by the time it got there, it wasn't good. Salmon doesn't spoil when it is dried. M-53, 8/20/11

We catch moose and caribou and give it away; it ensures good luck back. Even beaver, you give the whole beaver away after you skin it. After you skin the beaver, you give it away; give the whole beaver away. That animal that you give away...give[s] you back in return good luck. M-54, 8/20/11

[My wife] and I have been doing it for thirty some years, doing the fish camp, and putting up fish for the winter. When the kids were small, we were down there for them too, and hopefully, they will have a family, too, and carry on the tradition. M-33, 8/18/11

Some of the salmon we put up at my fish camp even goes all the way down [to] the states. My friend [name] comes in here, and she puts up fish, and she cans salmon.... [My daughter] and her friend...they also can fish and dry fish.... [My grandson] was here all summer. F-27, 8/17/11

The parents, their sisters, their aunties, their grandparents, their great grandparents. Everybody is there [at fish camp], you know, telling them [the children] how to do this....Everybody does it at their own camps, fish camps.... Everybody is living in different fish camps, so all these families that are together, that's how they taught the younger kids. F-28, 8/17/11

He [five-year-old grandson] went fishing with us once; now, he went and seined with us. That's ...how we learn, that's how we teach our kids [fish camp]. I mean, it's togetherness. F-30, 8/17/11

One of the things we were taught and we are teaching our kids and grandkids are that you do not waste. Boy if they let the fish get rotten boy they would be disappointed in us really bad. So we teach and pass that on, don't waste nothing. M-29, 8/17/11

We usually get our subsistence foods, salmon, and a wealthy person, years ago, was when he had a lot of dry fish for his dogs, salt fish, smoke fish. The women had their wooden kegs full of berries for their Eskimo ice cream. Maybe the father was fishing commercially and made enough to buy a few groceries form the store, enough [rifle] shells. That was a wealthy person. I think today a lot of people still think the same way. M-62, 9/16/11

Yeah, I think growing up in a small village wealth was defined by what you provided for your family. If you were a highline fisher, you were very wealthy, both physically, as well as mentally. If you were a good hunter, that in itself was very wealthy. Or a good trapper, good provider. M-61, 9/16/11

Salmon is one thing. They make you feel rich, because you have something to eat all winter. Smoked salmon, sun-dried spawned-out fish, all of those make you feel good, because you grew up with it; it is in your body. M-53, 8/20/11

As long as we have a lot of fish and meat and stuff, they are wealthy. We don't believe in... having lots of money. The wealth to us is having more fish put away for the winter, and meat; that's our wealth. F-27, 8/17/11

In this Western society of living in the city, everybody is for themselves. Everybody is worried about “Joe Blow” next door, who has a bigger TV or a bigger car; they are worrying about money, money, money! It just brings on the sickness of worrying. Here, we run a healthy life, because we have everything we need here; everything we could possibly want is right here. F-32, 8/18/11

2. Introduction

Though each has a different cultural social organization going back to pre-contact times, today there are many similarities between the Dena’ina and Yup’ik of the Nushagak and Kvichak River watersheds. Among them are the importance of sharing subsistence foods, fish camp as a social and educational as well as economic institution, gender and age equity, and the concept of wealth.

3. Sharing and Generalized Reciprocity

The Yup’ik and Dena’ina cultures center on belonging to community and on sharing food as a means of creating and maintaining the living bonds of relationship. The focus on sharing functions as the elemental ordering factor in sustaining the culture and the long-term health of the communities. “Sharing food ensures the survival of groups both socially and materially” (Counihan, 1999:13). Interviewees indicated that the sharing, preparation, and consumption of food together has created opportunities for efficient and sometimes ritualized teamwork, as well as social bonding and building of networks, for much of human history; the Yup’ik and Dena’ina of the Nushagak and Kvichak River watershed villages, as traditional cultures, continue these practices through harvesting, preserving, and preparing food together and sharing food through traditional practices and ritual celebrations. They continue to experience the social, spiritual, and nutritional benefits from sharing food, especially salmon, the staple food, up to the present.

Sharing remains a fundamental institution within Yup’ik and Dena’ina cultures today according to interviewees, and the importance of sharing food, especially salmon, cannot be

overemphasized. Among the Yup'ik, for example, *elaqyaq* means “those of the same stomach” and refers both to sharing food and being biologically related. Oscar Kawagley noted a similar linguistic reference: “The Yupiaq [Yup'ik] term for relatives is associated with the word for viscera, with connotations of deeply interconnected feelings” (Kawagley, 2006:11). As Langdon indicates, the time people spent together in subsistence activities extensive: “The Yupiit [Yup'ik] enjoyed the bounty of some of the world's richest salmon fisheries. Large quantities of fish were harvested and processed through relentless hours of work in order to sustain families and their dogs throughout the long winters” (Langdon, 2002:41).

Yup'ik and Dena'ina sharing is “generalized reciprocity,” because the time and place of a return gift is not specified. In general, interviewees indicated that people do not expect a return gift when they share salmon or other subsistence foods with someone else, particularly an elder, but a return gift of food always seems to appear, whether that month, that year or sometime in the future. The altruism is part of social solidarity. Villagers do not consider sharing to be an obligation, but a way of life, as the Voices of the People at the beginning of this section indicate. Interviewees universally indicated that giving or receiving salmon or other subsistence foods makes them feel good. The altruism of sharing food expresses social solidarity between the participants. Almost universally, Dena'ina and Yup'ik seem to have small jars of salmon available for visitors to take with them.

Villagers particularly recognize some elders who cannot participate in the rigors of subsistence harvesting as people with whom to share salmon and other subsistence foods. The informal first salmon sharing, for instance, always seems to include elders (see Section III.E.3.).

Sharing salmon and other subsistence foods with family living in Anchorage or even farther away is an important bond to home, family, and place. Interviewees consistently talked about how much they appreciated a gift of canned or jarred salmon from home when they were away from the village. They also talked about how important it is for them to send a part of the place to family and friends living away from Bristol Bay.

The Dena'ina believe that tangible items can take on aspects of the owner. This personification is called *beggesha* if the aspects are positive and *beggesh* if negative (Boraas and Peter 2008: 215-9). Artifacts or places can have *beggesha* or *beggesh* depending on events associated with them. A place, something someone made, such as a birch bark basket, or salmon someone prepared take on *beggesha*. The term does not easily translate into English, so today people talk about giving “love” when giving a gift of something they made or prepared. Conversely, one receives “love” when receiving a similar gift. This perspective is one of the reasons that Native foods, especially salmon, are served at all gatherings such as potlucks and potlatches. Preparing and giving food is a tangible act of love. Recipients appreciate non-Native foods, but they are not from the place, were not made by the giver and, consequently, are not an expression of love when gifted.

4. Fish Camp

Both the Dena'ina and Yup'ik have a long tradition of going to fish camp to harvest salmon. As interviewees indicate, the villages of the Nushagak and Kvichak River drainages harvest salmon either at or very near town, and fish camp may be only a short boat ride or four-wheeler trip to a traditional fishing locality where they may or may not camp out (cf. Fall et al. 2005). Many villagers, however, still travel to a traditional place, set up camp, and live for

several weeks catching and putting up salmon. Villagers from Kokhanok, for example, travel to fish camp on Gibraltar Lake, while residents of New Stuyahok, Ekwok, and Koliganek stay at various camps on the Nushagak River, downstream of the villages and villagers from Nondalton go to camps on Sixmile Lake and Lake Clark. Generally, the interviewees indicate the fish camp consists of an extended family, with three or more generations, but close friends may also participate (Fall et al. 2010).

Families typically view fish camp as a good time when they can renew bonds of togetherness by engaging in the physical work of catching and processing salmon. Family members who don't live in the villages often schedule vacation time to return home to fish camp, not just for the salmon, but for family. The importance of sharing in vigorous, meaningful work cannot be overestimated. It creates cross-generational bonds between children, their parents, aunts, uncles, and/or grandparents that, today, are rare in Western culture because there are so few instances in which meaningful, multi-generational work occurs (Interviews, 2011).

Fish camp is a time when children and teens learn not only the practice of how to properly catch, clean, and process fish, but the values that are an integral part of harvesting salmon and interacting with nature. As such, it is a primary educational institution (Fall et al. 2010). Young people learn from their parental generation and, particularly, from their grandparents, their elders, about the Yup'ik or Dena'ina way. The primary value passed on at fish camp is respect for nature and, particularly, respect for salmon. As discussed in Section III.F.4., showing this respect involves using everything and disposing of what little is left over in a respectful manner. Fish are not disparaged, bragged about or made fun of. Catching salmon

with a good attitude is the first step in imbuing it with the *beggesha* or love discussed in the previous section.

5. Steam Baths

In many villages, informal gender-specific groups meet several times a week for steam baths in small wooden buildings heated with wood fires and share stories, the advice and wisdom of the elders, and cultural connections. In some ways, these steam baths, or *maqi* as the Yup'ik call them, have taken the place of the men's traditional house, *qasgiq*, and the women's house, *ena*, where the transmission of cultural values and knowledge traditionally occurred, as well as much entertaining talk.

6. Gender and Age Equity

Gender equity among subsistence families is balanced and has many of the characteristics of a traditional family farm or family-run business. Both men's roles and women's roles are equally valued, and it is common that men can do most "women's" activities (cook, clean fish, etc.), while women can do most "men's" activities (shoot a moose, run a boat, etc.) (Interviews 2011).

Traditionally, elders are important members of village society, seen both as sources of values and storehouses of traditional knowledge, and they are valued in child-rearing, village decision-making, and life guidance. A common saying in the villages is: "When an elder dies, we lose an encyclopedia."

7. Wealth

When asked their perception of wealth, only 3 of 53 interviewees, all from the same village, indicated that they measure at least part of their wealth in terms of money, material items, and potentially high-paying jobs (see Section III.E.7.). The remaining interviewees who

commented responded that wealth is in terms of one, or more, of three themes: food in the freezer, family, and/or freedom.

To the majority of interviewees, stored subsistence food means a family is wealthy or rich. Various entities attempt to monetize this value, but to the people, subsistence is priceless. It means you won't starve; it means you will have among the healthiest diets in the world; it means you will be able to actively engage in the sharing networks described above; and it means shared, activity that enhances family and/or village togetherness. A full freezer (or freezers, as is often the case), a well-stocked pantry and a full wood bin are the primary symbols of wealth in the Nushagak and Kvichak River villages. Most villagers, of course, recognize that money is a necessity, but money is not the singular measure of wealth. Money is necessary for the tools for subsistence, gas and oil for boat and house, and occasional travel, and locals generally acquire it through part-time jobs or commercial fishing that still allows time for subsistence activities. By Western materialist standards most of the villages are poor; by their own standards Nushagak and Kvichak River villagers are rich, and it is the people who live a non-subsistence lifestyle who are poor (summarized from interviews, 2011).

Interviewees indicate that wealth also derives from having a large, extended family, particularly one that is closely knit by subsistence activities. Having an extended family means having people you can count on if need be, and it means having people to whom you can give your love and assistance. This tradition of alliance through marriage has its origin in pre-contact Yup'ik and Dena'ina culture (see Sections II.B.3 and II.C.2).

Few interviewees spoke with fondness of living in Anchorage or other urban places they have lived or visited. Though hunting and fishing require abiding with ADFG regulations, most

villagers see those activities as involving a degree of freedom that does not often occur in non-subsistence work settings. As described in many interviews, with subsistence as your job, you don't have to punch a clock, you only follow nature's clock; you don't have a boss, you are your own boss, and you either suffer the consequences if you are not a good one or reap the benefits if you are. During our May visit to one village on the Nushagak River, two young men in their early twenties left on a 17-day subsistence trip upriver into the Mulchatna area, one of the most remote places in North America at any time of year, but virtually deserted in spring, when snow was still present. They were on their own, and apparently all who were connected to the endeavor embraced that freedom. As they left, for example, the mother of one of the boys simply said, "Be careful," just as a parent living on Alaska's road system might say to a son embarking on a trip to Anchorage. This view comes from villagers having knowledge of and ranging over a vast territory, almost all of which is in a natural state. Consistently, people are thankful to live in a place where they can live off the land in the manner of their ancestors, and don't want to live anywhere else (Interviews, May – September 2011).

E. Spirituality and Beliefs Concerning Water and Salmon

1. Voices of the People

a. Respect and Thanks

Yes, they do [streams have a spirit], like everything else, all living things. Before Russian Orthodox came here, that is what we worshipped. We worshipped all the living things, even the air, the sky, the moon, the sun, snow, rain. It is in every aspect of our lives, how we are made up, what we believe in, why are we still here? M-33, 8/18/11

They say everything on Earth has a spirit, like we have a spirit. So everything has spirits, the streams, the waters, the lakes, the mountains, trees, birds; everything has a spirit. To me, I think, that's why we have to pray, and you have to keep the streams clean, not pollute it. F-27, 8/17/11

I think that, if you treat animals disrespectful, that they are not going to show up again. F-32, 8/18/11

Yes, like all other things you are granted, you give thanks for [salmon]. F-69, 9/18/11b.

b. First Salmon Ceremony

The first salmon, it's still tradition to share with everybody. You do say a prayer. F-47, 8/20/11

When we catch the first king salmon, about this month [May], maybe next week, we share that king salmon, cut in little pieces, to give to them to cook, especially to the elders, because they always want fresh fish. F-22, 5/18/11

First catch is shared with all of the elders. Elders first, always the priority, elder, because they cut it in pieces, you know, if you catch a king, you share, instead of eating the whole fish by yourself. The first catch. M-20, 5/18/11

Tradition--first salmon, the very first salmon you catch you boil everything, everything. You don't waste anything then you eat it too. I mean, even the liver, if it's a male the sperm sac, everything. M-29, 8/17/11

Every year, when I first catch a King salmon, I usually pray to God and thank Him for it. A lot of people do the same thing, because He is the one giving us these wild foods. M-63, 9-18-11

c. Great Blessing of the Water

There are a lot of folks along the Nushagak, down to Dillingham, and along the chain that are Orthodox because of the Russian influence. They actually have three ceremonies in the church that deal with the salmon. The first one is the Blessing of the Water in the winter time. You have probably seen the newspaper articles about the priest that goes out there and blesses the water. It can be minus 40 or minus 50 [degrees Fahrenheit], and you seem them running that cross in the water, and they never freeze. That in itself is a miracle, I think. The other thing that happens is that, just prior to fishing, the church has a special service of the blessing of all the resources. The third thing is the blessing of the fishing boats. The individual fishermen, when they get done with all their nets and all their gear, they can ask the priest to come and bless their boats. M-81, 9/16/11

They do it every year at Theophany.... It's very important to us; it's a blessing of the water, blessing the river so the fish come in. It's an Orthodox religion ceremony. M-20, 5/18/11

The Holy water is so pure. We believe it is healing, has healing powers. When you are sick or have a cold, have just a little tiny bit. F-69, 9/18/11

And over on the Iliamna side, they will do the same thing that Father will do over here with the water, make holy water. People will come down there too with either buckets or jugs and fill them up. M-65, 9/18/11

I used to live in Portage where there is no clinic. That is the only thing I could give my kids. You know pray upon them and let them make the sign of the cross and let them have a taste of the holy water. F-72, 9/19/11

That holy water is strong. To be honest with you people, I would not be talking with you right now[if not for holy water]. A long, long time ago before I become a lady, we were upriver with my mom and dad. My mom was sick too, my grandparents and dad, too, and uncle. In night time, I guess I almost go [die], you know, but my dad, he prayed for me....[Later] my dad tell me I have no more breathing, no more pulse. And when I come to, my Dad was holding me like this, up you know, seeing [if] my heartbeat. As soon as I opened my eyes my Dad said 'you get up'. I said yeah, I was going to sleep, how come he woke me up? I was going to go to big church [heaven], and my Dad said I can't go to big church. When he tell me that I told him holy water... 'give me holy water to drink'. He did, my dad, he did. I opened my mouth, I swallowed, the water was going down into my stomach... I closed my eyes, pretty soon I come through. My dad was up, my momma was sleeping, she was sick too. [Yup'ik] I go but I came back. Almost going to that big church. My dad he tell me not to go into the church, come back, that's why I become a lady. It's true, I tell you guys the truth, better not forget that. Holy water is strong, that is what made me come back. F-66, 9/18/11

2. Introduction

Most of the residents of the interior villages of the Bristol Bay drainage are Russian Orthodox Christians, and the Orthodox Church, along with the public school and the tribal structure, is among the dominant institutions in the small villages. Many of the villages have a resident priest or priests; for others, clergy visit periodically on a scheduled basis. In some villages Protestant churches have formed: Pedro Bay, Port Alsworth, and Dillingham have Protestant church buildings, the latter in addition to an Orthodox church.

Beliefs concerning streams and salmon, in those villages where Orthodoxy is the dominant religion, involve a syncretism merging traditional beliefs with Russian Orthodox

practice. Dena'ina writer Peter Kalifornsky (1991:249) described syncretism when writing about his great-great-grandfather's nineteenth century message to the Dena'ina people after his conversion to Orthodoxy: "Keep on respecting the old beliefs, but there is God to be believed in; that is first of all things on earth." Russian Orthodoxy itself has a syncretic tradition of melding Middle Eastern-derived Christianity with spirituality influenced by the northern environment. Billington (1970:18-19, and 403) points out that, though Orthodoxy moved north from Greece and Asia Minor into Russia in the ninth century A.D., its long history in the northern forest has shaped the belief system to interpret and interact with aspects of the subarctic taiga. Billington writes, "God came to man not just through the icons and holy men of the Church but also through the spirit-hosts of mountains, rivers, and above all, the forests" (Billington 1970: 403). Consequently, many Russian Orthodox rituals involve interaction with nature. The mystical aspects of Orthodoxy fit well with traditional Dena'ina and Yup'ik beliefs, many of which related to interacting with the landscape on which their survival depended (Boraas, in press). For the Dena'ina and Yup'ik living in the Nushagak and Kvichak River drainages, beliefs regarding pure water and the return of the salmon, discussed below, ritually and spiritually express the meaning of life as people of the salmon.

3. Great Blessing of the Water

The "Great Blessing of Waters" takes place during the Feast of Theophany, a major event in the Orthodox Church calendar and is celebrated on January 6th of the Julian calendar, the calendar of Orthodoxy (January 19th in the Gregorian calendar). While all church rituals are important, Theophany can be considered to be the third most important church ritual after Christmas and Easter. (personal communication, Fr. Alexis, St. Sergis Russian Orthodox Church, New Stuyahok,

January 19th, 2012). A theophany is an event in which God reveals himself to humans and the Great Blessing of the Water marks the baptism of Jesus by John the Baptist. After Jesus' baptism God appears saying, "this is my son whom I love, with him I am well pleased," (Matthew 3: 17, New International Bible). As explained by Fr. Alexi (personal communication, January 19, 2012), in the Orthodox view, baptism both redeems sin and brings the Holy Spirit to the recipient. Orthodoxy believes in the triune God so Jesus was God and without sin. So Orthodox Theophany transfers the ceremony to one of God's most important creations, water, and one of the creations most important to the people of the Nushagak since salmon and related wild foods are dependent on clean water. An evening church service is held on the eve of Theophany. At the service I (Alan Boraas) attended, 211 villagers of New Stuyahok attended. The next morning a communion service was held and, as the sun rose, the people led by the priests went out onto the frozen Nushagak River where an Orthodox cross had been cut into the ice. There a baptism service was held baptizing the water of the Nushagak and in the process making it holy. According to Father Michael Oleksa the Great Blessing of the Water is done to "reaffirm the Church's belief that the natural world is sacred and needs to be treated with care and reverence" (Orthodox Church in America). The Orthodox Saint John Maximovitch (n.d.) writes:

...when we bless waters of lakes, rivers and streams, we ask God to send His blessings upon the waters of His creation so that even though humanity has spoiled the world through sin and abused the environment over many generations, God has not forsaken the world. He sends His spirit to cleanse and sanctify His creation.

"Sin" in the form of human-caused pollution and other contaminants are ritually removed from the water and it is now considered pure and holy (personal communication, Fr. Alexi, January 19, 2012). In New Stuyahok, and other villages where the ceremony is performed, the now blessed

water is removed in containers; a large container is taken back to the church and individuals go to the blessing site on the ice, scoop up water before the hole refreezes, and take containers back to their homes as holy water.

Holy water from the rivers is believed to have curative powers for both physical and mental illness and is drunk or put on the affected part (Fr. Alexi, personal communication, January 19, 2012). Fr. Alexi told the story of one bitterly cold Theophany when he frosted his face during the ceremony. When they returned to the church one of the parishoners rubbed holy water on his face and he subsequently did not blister or suffer any ill effects other than one little spot the water had missed which left a mark for several years. Fr. Alexi believes God healed him through the holy water. An interviewee in Koliganek movingly told of a time when her children were gravely ill and there was no doctor, health worker, or suitable medicine available. She said, “all I had was holy water.” She had the children drink the holy water and in a few days they recovered. She attributes their recovery to the power of the blessed water.

From a secular standpoint, the question is not whether or not holy water has healing efficacy, but how the Great Blessing of the Water ceremony and holy water reflect values of the people. People elevate to the sacred those things that are most meaningful or critical in their lives. As described in section III.F.5, the Dena’ina word for water, *vin/ni*, has sacred overtones and water itself is sacred. Since the word predates Christianity in south central Alaska, we can assume sacred water has long been a part of the salmon cultures of the Nushagak and Kvichak watersheds. The Great Blessing of the Water ceremony is an obvious extension of that concept, rendering in Christianity that water is sacred to life.

4. Respect and Thanks

Water and salmon play additional roles in modern Orthodoxy in the study area as derived, in part, from traditional subarctic spiritual practices. Describing traditional Dena'ina beliefs, Kalifornsky (who was also a devout Orthodox Christian) writes (1991:362-363) that, after putting out his net, “*Łuq'a shegh dighelagh*” or “a fish swam to me,” indicating that the spirit of the salmon had a will and would allow itself to be taken for food if the net-tender had the correct attitude. Today, all interviewees that commented on it still believe that salmon have a spirit or soul and that soul is a creation of God. Further, all interviewees who responded report offering a prayer of thanks when they catch salmon, particularly the first salmon as noted in the “Voices of the People” at the beginning of this section. That prayer may be a humble “in one’s mind” statement or it may be spoken thanking God for the salmon.

Interviewees also still believe in treating all animals, including salmon, with respect. Several modern practices reflect this belief, for example, using the entirety of a fish for food, except the entrails, which villagers return to the water along with the bones that remain after consumption. Another example interviewees report is never allowing fish or meat to spoil. Interviewees repeatedly stressed the importance of giving salmon and all subsistence animals respect. This attitude echoes the pre-contact beliefs that animals had a will and, if not treated properly, would not allow themselves to be taken for food, leading to dire consequences for the people (Boraas and Peter 1996).

5. First Salmon Ceremony

The First Salmon Ceremony is a world renewal ceremony which, like other world renewal ceremonies, recognizes the cyclical onset (or end, e.g. Thanksgiving) of the most important yearly event in the culture. As mentioned in Section II.C.2, the First Salmon Ceremony was

described by ethnographer Cornelius Osgood (1976:148-9) and apparently practiced in pre-contact times and is based on a mythical story that merges people and salmon. Because of the importance of salmon in the lives of the Bristol Bay villagers, interviewees report they continue to mark the return of salmon in the spring by a special observance. The actual practice varies, but involves a prayer of thanks to God for the return of the salmon and sharing the first salmon caught in the spring with elders and others in the community. Typically, according to interviews, each receives a small piece, and there is a general feeling of happiness that the salmon have returned and the cycle of the seasons has begun again and nature will provide the people with sustenance. In some places the First Salmon Ceremony takes place at fish camp, where extended families and other present share the first salmon they catch with one another, including the elders. In at least one village, New Stuyahok, the ceremony includes sharing the first salmon with “the underground,” by placing a small piece of it under the forest mat at the cemetery, symbolically sharing salmon with the deceased ancestors buried there.

F. Messages From the People

At the conclusion of the interviews we asked interviewees if there was anything else they wanted to say, anything we had not covered, and/or any message they wanted the Environmental Protections Agency to hear. The following reflect those comments:

1. Voices of the People

I, myself, get very emotional when the topic of the Pebble Mine comes up. I don't even want to think about it. In the future I don't want to think about total ruin of our way of life. It really saddens me. F-69, 9/18/11

For quite a few years there when we were building up the king salmon run we didn't even fish in June. It was just to build up those runs. It is kind of ironic that the kings we built up are on the Kaktuli River where that mine is going to go. It is almost a whole decade that we sacrificed to build up that run. We built it up and now it might go away. M-61, 9/16/11

You don't see Bristol Bay having troubles because our ecosystem is whole and not damaged. We are very appreciative of what we have. In relationship to the mine the place I work up here is the Bristol Bay Economic Development Corporation and... one of the companies we bought is Ocean Beauty Seafoods which is one of the largest salmon producers in Alaska. We put up 161million pounds of commercially caught goods in a year. So I talk to the people and if there is a mine that goes in like pebble and we have copper coming out and affecting our fish, are you interested in buying our fish? These are customers we sell 300-400 thousand pound lots to. No, we are not interested....We don't want ourselves and our kids to eat contaminated foods. M-60, 9/16/11

It is clear, good water to drink. This is what we protect our good water to drink. F-48, 8/20/11

We can't even fathom somebody hurting the salmon. When the pebble mine folks first came in they said they were going to pump the tailings right into the middle of the lake. We said you are going to kill the lake. They said you guys got no say so....We said no you'll kill the lake. We couldn't fathom it. We said you kill the lake and we will go to war. M-60, 9/16/11

Since the Pebble Mine started their exploration, I speak for everyone around here that we have not had the big caribou herds that come through here anymore. F-69, 9/18/11

That is our greatest fear about the mine. The size of the hole and the tailing pond they are going to build. You know you see our KDLG water tower up here and the size of the walls are going to be greater than that and if we get a spill we are done. What we say is that we can't afford the risk. The mine might be safe but there might be an earthquake and pollution happens. We can't afford the risk. M-60, 9/16/11

In Easter they went up to Koliganek the next village up. He said people up there caught white fish and pikes. He said the water is good upriver, it's not like down here. I think it's the water that is coming down from up Mulchatna. He thinks it's from them working on that pebble up there [pebble mine]. F-23, 5/18/11

There's open water all over. They got drilling rigs that are sitting on open water. You can't walk up there with knee boots you got to have hip boots there is so much water this year. The ground is saturated. M-60, 9/16/11

[Translator of 80+ year old Yup'ik-only speaking elder] He is only worried about the Pebble, right now. If the Pebble starts, the water is going to get effected before anything else. That's what he is worried about. M-21, 5/18/11

We feel that EPA is very important around here to give us a fair shot at examining this. Our governors, some of us are related to Sarah Palin you know its "dig baby dig", "drill baby drill" she didn't give a damn about us. We got a governor down in Juneau right now that doesn't give a damn about us. We got DNR bought off by Anglo-American, you know they'll put the money in, they're not listening to us. The Lieutenant Governor was out here a few weeks ago. I tried to talk to him about the effects of mining it was like talking to Tommy's Styrofoam cup. You know they are all for this economic development. You know economic development up in that mine they are going to bring in outsiders they are going to destroy the culture up there like you wouldn't believe. Most of the outsiders will, most of the jobs will go to outsiders and we will be left with the pollution. M-60, 9/16/11

They [Salmon] would not go there [where water is contaminated] They are also very sensitive to temperature. They have a really keen sensory acuity, not only them, but all the critters, all the birds. ...They are so sensitive in every aspect of that word. ...It's relying on the renewable resources for our people have been going on for a long time. The respect for it, it is still there for those of us who do respect it. We have been sharing it with everybody. Nobody was jumping up and down, hollering about one group or another, until the Pebble people came. We took all these resources just for granted. We did not know anything about open pit mine or mining. I realize as human beings we need mines. I have to buy bullets now and then. I have to buy a prop for my outboard motor. I have to go buy bearings for my Honda. This is not a place to have that. They cannot have that here. There is no balance there. They talk about coexistence, that is not...that's coming from the other side. That stuff can't coexist with salmon. Are you going to compare coal to copper? Copper is a thousand times more devastating than coal. [M-33, 8/18/11

The drill wells are making all the noise. We were over there, my wife and I were over there last spring, and when we went over there to check out the Pebble, there [we] saw three other helicopters right in the same area, and that's lots of traffic. We have not had caribou meat around here ever since. Haven't had caribou meat caught here in probably the last six years. M-68, 9/18/11

Bristol Bay is renowned for what it has to offer. Like I was saying earlier, this region had a very good working agenda before the Pebble people came. M-33, 8/18/11

[Name] went with her and she is about 88 years old [mother and daughter on an Outside mine visit]. They went out to look at mines and [name] cried at every mine she looked at, she couldn't believe that man would be that disrespectful of the earth. She said literally cried... like her brother, mom or dad died. She represents us all, we can't see destroying the earth like that. We're not greenies you know we are far from green but we can you know. Without EPA we are sunk. Our state representatives, half our congressional [representation] look at what Don Young said the other day when Cantwell down in Washington said I am going to oppose [the mines], I want EPA to oppose. Christ, the politicians came unglued. I don't care if we have to rely on [outside representation]. [If] we can't rely on our representatives or congressional delegation from the state we will rely on Oregon and Washington to kill this damn mine because it is going to kill us in the end. We know it is just a matter of time. All of us have had a few cocktails and drove, one of these times we are going to have a few cocktails and get in a car wreck. It is just a matter of time. Just like that mine. We really feel helpless with the state government. It is like we are dispensable out here and it is better for the big boys to come in. that is what the mine people are telling us. Right guys? When they first started coming? You got no say, so we are coming. M-60, 9/16/11

And what is going to happen when this mine closes up? Our great-great-great grandchildren are going to end up paying for it. IF they are fortunate enough to still be living in Bristol Bay if the salmon, the streams are not contaminated and sustained. I hate to think of the future if this mine goes through. The long haul it is going to be devastating. M-62, 9/16/11

IV. CULTURAL VULNERABILITY

A. Introduction

As described in Sections II and III, the Yup'ik and Dena'ina cultures of the Nushagak and Kvichak River watersheds practice a subsistence lifestyle that developed over several thousand years of living in the area and depends primarily on salmon. As illustrated by the elder and culture-bearer interviews, this lifestyle has built strong, connected networks of extended families and a culture based on sharing, traditional knowledge, and respect for the environment.

Each of the villages now has schools, city government or tribal council, a health clinic, post office, small store, church, airstrip, and electricity and running water in most homes. Basketball games in the school gym and bingo at the council building, and sometimes Yup'ik and Dena'ina dancing, are popular in the evenings. Four wheelers and snow-machines are everywhere. These changes are recent, however; up until about sixty years ago, traditional dog sleds and kayaks provided the transportation, and caring for dog teams took much time and effort. The availability of material goods from beyond the villages was limited, modern housing was nonexistent and formal education was mainly offered through boarding schools. After ANCSA altered land ownership patterns in 1971, the coastal communities of Southwestern Alaska experienced steady growth (Fienup-Riordan, 1994: 39).

These changes have resulted in some loss of traditional cultural practices; for instance, people no longer openly practice the Bladder Festival, *Kelek* or *Petugtaq*, although essential elements of these can be found in more informal practices, and in some cases transformed through corollary rituals in the churches (see Section III.B.3, 4). Other changes have been more severe and have both made the communities more vulnerable to changes in their environment

and placed them at higher risk for further cultural and individual losses. Examples of such changes include loss of control over traditional use areas, loss of community members to Western diseases such as tuberculosis and outmigration of young people, for either employment or education, the latter of which included, in the past, the involuntary placement of children in distant boarding schools, removed from the traditional culture (Interviews, 2011).

The cultural and social impacts associated with Westernization have been described as anomie. Merton (1938: 682) gave a classic definition where he writes, “At the extreme, predictability virtually disappears and what may be properly termed cultural chaos or anomie intervenes.” Anomie, the loss of meaningfulness, sense of belonging, and direction in life has occurred among Yup’ik and Dena’ina and probably among all Alaskan Natives cultures. Anomie increases cultural and individual risk for social ills such as depression and suicide, alcoholism and drug abuse, domestic violence, and aggressive behaviors (Paul Smith, pers. comm.). Healing practices can include those used for trauma and post-traumatic stress disorders, including traditional practices that reconnect the individual to society and the natural environment through meditative rituals. Traditional drumming, singing, and dancing have been shown to be effective in treating trauma and post-traumatic stress. Culture camps and other methods of cultural revitalization (see Section III.E.4, 5) can be both preventative and healing for children and adults of indigenous cultures. It is critical to assess future risks and vulnerability, and take appropriate measures to reduce both.

Despite the past disruptions they have experienced, the underlying cultures have so far endured among the Yup’ik and Dena’ina people. Wholesale changes to the ecosystem that supports their subsistence resources, however, whether they come from large-scale development,

including mine development, in the area, climate change, and/or declines in the integrity of the North Pacific Ocean, carry with them the risk of substantially altering the subsistence lifestyle and the Yup'ik and Dena'ina cultures themselves. Among the specific potential risks associated with diminishment in either the quantity or quality of subsistence, and especially salmon, resources are:

- Degradation of nutrition and physical health due to diminishment of subsistence foods and lifestyle.
- Loss of political power due to becoming a minority in one's own homeland, if there is an influx of outsiders to the region due to development.
- Deterioration in mental and emotional health due to the loss of traditional culture and meaning for life.
- Loss of language and traditional ways to express relationships to the land, one another, and spiritual concepts.
- Loss of meaningful work by extended families operating together.
- Reduction of gender equity resulting from loss of important economic activities and social networking opportunities, due to the potential diminishment of subsistence foods harvest and preparation, and replacement of this work with jobs that are typically more accessible to men (e.g. mining) or to fewer women (such as those who do not have small children).
- Loss of the means to establish and maintain strong social networks through sharing of subsistence foods.
- Impact on belief systems that revere clean water and a clean environment.
- Increased discord within and among villages because over eighty percent of the population in the villages are rejecting the development of mines in the region (BBNC statistics); the difference between the majority and the minority over this issue within the villages, and in the one village where there was a large and powerful family in favor of large-scale mine development, has the potential to create long term rifts within the villages and between them (cf. comments from individuals in the Bristol Bay region villages and in Dillingham are also similar to situations in the Navajo-Hopi land disputes exacerbated by Peabody Coal Mine).

Yet these communities have suffered extensive social damage due to the stresses of modern colonization and industrialization of their region, beginning a little more than 200 years ago. The impacts of foreign powers and cultures, through epidemics, including recent tuberculosis epidemics, the loss of control of their lands and waters, and the removal of children from their homes and culture for schooling in the past (Interviews, 2011), have made these communities more vulnerable to changes in their environment, and at higher risk for both severe cultural and individual losses.

Some interviewees expressed a fear of the future that a prophecy of “bad times” told by elders might be coming true resulting in cultural loss characterized above as “anomie,” the loss of meaningfulness, sense of belonging, and direction in life. Anomie increases cultural and individual risk for social ills such as depression and suicide, alcoholism and drug abuse, domestic violence and aggressive behaviors (Paul Smith, pers. comm., 2004). Healing practices can include those used for trauma and post-traumatic stress disorders, including traditional practices that reconnect the individual to society and the natural environment through meditative rituals. Traditional drumming, singing, and dancing have been shown to be effective in treating trauma and post-traumatic stress (Perry, 2006:38-9). Culture camps and other methods of cultural revitalization (see following section III.E.4) can be both preventative and healing for children and adults of an oppressed culture. It is critical to assess future risks and vulnerability, and take appropriate measures to reduce both.

B. World Risk Index

To contextualize the cultural risks in the Nushagak and Kvichak River watersheds, we have applied an adaptation of the World Risk Index (WRI). The WRI defines risk as: “the

interaction between a natural hazard and the vulnerability of a particular community or region, according to Dr. Jorn Birkmann, scientific head of the WRI project at the United Nations Institute for Environmental and Human Security ([IRIN](#), 2011). IRIN notes that, “WRI takes into account social, political, economic, and ecological factors to determine the capacity of an affected community to respond” to natural hazards and/or climate change. It employs the following four categories, at the local level, from Birkmann et al. (2011:14-16):

Exposure of people, ecosystems, and coupled social-ecological systems to the possibility of a hazard event.

Susceptibility, or the likelihood of damage to society and/or ecosystems from a natural hazard occur.

Coping capacity, or the ability to respond to a hazard event so as to minimize its negative impacts.

Adaptative capacity, or the ability of a community to implement long-term strategies to address potential future impacts before they occur.

The WRI addresses natural hazards, including both those with sudden onset, such as earthquakes, volcanic eruptions, and floods, and those with slower onset, such as climate change and sea level rise, or loss of food resources. Although not natural in origin, the potential adverse impacts of large-scale development on the environment and local populations of the Nushagak and Kvichak River watersheds run parallel to both the WRI’s sudden- and slow-onset hazards. For purposes of this project, we identify the “hazard event” as the degradation or loss of local wild salmon populations and habitat, as well as freshwater fish, and other subsistence resources, as a result of large-scale development and/or environmental changes and adapt some of the WRI

indicators to assess the risks to and vulnerability of the area's Yup'ik and Dena'ina cultures from such a loss. The following four sections address each of the WRI categories separately.

The impact of the development of large scale mines on the natural environment, and the potential for interaction with human error, or with natural disasters such as global climate change, large earthquakes, and volcanic eruptions, makes the World Risk Index a useful analytic tool. Should an accident or failure occur, for example to a tailings dam, in the event of human error or earthquake, all the predictive factors of the World Risk Index would apply. The World Risk Index also covers slow onset disasters such as drought, or famine, and climate change, or the slow but steady loss of the Yup'ik staple food, local wild salmon. The World Risk Index employs the following categories:

- Exposure to a natural hazard (sudden as well as slow-onset natural disasters like droughts).
- Susceptibility, which is understood as the likelihood of society and ecosystems to be damaged should a natural hazard occur. Existing economic, infrastructure, nutrition and housing conditions are taken into account.
- Capacity to cope, which looks at the state of governance, disaster preparedness and early warning systems, medical services, and social and material security levels. "Governance is a critical issue as it is politically sensitive which is why it is overlooked by many similar indices, but the fact is you need a stable government that has the capacity to deliver to help people become resilient," said Birkmann. He illustrated his point by contrasting the impact of the recent earthquakes in Haiti and Japan. "Owing to higher coping and adaptive capacities, such as building laws, there were significantly fewer victims in Japan."
- Adaptation strategies - implying the capacities and strategies which help communities address the expected negative consequences of natural hazards and climate change.

The World Risk Report 2011 uses the example of Japan's recent earthquake and subsequent nuclear meltdown to show that natural disasters and large scale development are interlinked in their consequences for local, regional, and even national populations. In a section titled, "Japan – the incalculable risk of nuclear energy," the report states:

The severe earthquake in Japan in the spring of 2011 and the subsequent nuclear meltdown prove that even the countries that perform well in the World Risk Index in the categories of susceptibility, coping capacities and adaptive capacities, cannot cope with all disasters – i.e. when uncontrollable risks are known, assessed incorrectly or even tolerated. In this case, even the most stable framework conditions are not adequate for the management of the disaster (World Risk Report 2011, p. 10).

By using the World Risk Index indicators for local risk assessment, and analyzing current socio-economic conditions and trends for the Yup'ik, as well as the Dena'ina, in their current villages and towns in the Bristol Bay region, it is possible to look at environmental risks in a context that includes risk to cultural survival.

C. Exposure

To measure this component, the WRI determines the extent of the study population that is exposed to the potential hazard event (e.g., the percent of the human population living in dangerous proximity to an active volcano). For this assessment, we have defined the hazard event as the degradation or loss of local wild salmon populations and habitat. The measure of exposure, then, would be the extent of the human population whom loss of salmon would affect. Although such a loss(es) would affect others beyond the local residents, this assessment focuses only on those living in the Nushagak and Kvichak River drainage communities. Table 11 presents data on the use of subsistence salmon resources for each community, which ranges from a low of 88.2% of households in Dillingham to 100% in Igiugig, Iliamna, Koliganek, Newhalen, Pedro Bay, and Port Alsworth. Using the population data from Table 2, the weighted average use of all subsistence resources, including salmon, for all communities is 98.8% of households, representing a very high level of exposure to the potential hazard event (i.e., a very high proportion of local residents whom loss of salmon would affect).

The exposure to natural disasters in the Bristol Bay region can be high. It is part of the Ring of Fire, identified as an area where large numbers of earthquakes and volcanic eruptions occur in the basin of the Pacific Ocean. Earthquakes occur nearly daily in the region (Alaska Earthquake Information Center www.aEIC.alaska.edu), which includes two major fault lines. Two of the seven largest earthquakes of the past century have occurred in the Aleutian Islands. AEIC reports that “on average, Alaska has a magnitude 7.0 or larger earthquake about every two years.” The 1964 earthquake, 9.2 on the Richter scale, the most powerful recorded earthquake in U.S. history, occurred in another part of Alaska but affected Bristol Bay, according to residents from the villages and Dillingham who were interviewed. “The Castle Mountain fault has one fork near Lake Clark. It is part of a fault field in Cook Inlet, where earthquakes of 4.6-5.7 occurred and where a magnitude 7 or greater can occur” (Higman, 2008).

Volcanoes also ring the area; Augustine erupted in 1986 and in December 2005 with a lava flow visible from Homer; Redoubt erupted in 1989 and most recently on March 15, 2009, when the thick ash which coated the southern Kenai Peninsula blackened the sky as far as Homer. A larger volcanic eruption on Katmai in 1912, the largest in the world this past century, resulted in the devastating deposition of 14 inches of ash. Wildlife and plants died and the region was heavily affected for over a year. Iliamna erupted in 1953, 37 miles SE of Lake Clark. Mount Trident also erupted from 1954-1973, 22 miles from Naknek Lake. Volcanic eruptions are a high concern for residents of local villages. For example, a volcanic event in Nondalton, the village closest to the mine site on the northern end, “could make the community vulnerable to economic losses through closure of businesses and government facilities, disruption in communications, disruption of the provision of utilities such as water and sewer services. . .the community would

also be vulnerable to complete shutdown of critical facilities that may occur for more than one week” (Lake and Peninsula Borough, 2009).

Flooding is also not uncommon; for example, Kokhanok experiences periodic flooding on the coastline, and an active erosion area. “Erosion from the Kvichak River is the number one hazard in Levelok”, according to the Multi-Jurisdictional All-Hazards Mitigation Plan (Lake and Peninsula Borough 2009). In Newhalen, flooding might affect the school if flooding increases, and the sewage lagoon is threatened by flooding. In some instances flooding has resulted in the relocation of villages (GAO report. www.gao.gov/newitems/d04142.pdf). Finally, climate change is increasing both average temperatures and precipitation across most of Alaska (Tetratich, 2010). Climate change has effects in the Arctic and subarctic zones, including thawing of the permafrost, and melting of glaciers. These effects have begun, and are expected to continue to escalate in the next two to three decades, if not longer. A rise in sea level and increasing ocean acidification are also predicted in the same time period (Goudie, 2006:234).

D. Susceptibility

To assess the relatively susceptibility of a human population to damage from a hazard event, the WRI considers five indicators: lack of public infrastructure (drinking water and sanitation); housing conditions; nutrition (extent of malnourishment); poverty and age dependency rates; and economic capacity/income distribution (Birkmann et al., 2011:19). Some of these indicators apply, with adaption, to assessing the likelihood of damage to the Yup’ik and Dena’ina cultures from the potential degradation or loss of wild salmon populations in the Nushagak and Kvichak River drainages or loss of clean water (e.g., nutrition, poverty and age dependency rates, economic capacity), while others (e.g., access to sanitation, housing conditions) do not. At the

same time, there are other characteristics of the regional Native “society” that would be susceptible to damage from the loss of salmon, but that the WRI does not address, including many of the cultural characteristics discussed in Section III. The following sub-sections assess susceptibility from the standpoint of the five components of Section III (subsistence, physical and mental well-being, traditional ecological knowledge, social relations, and spirituality and values).

1. Subsistence

a. Scope of Subsistence

- Should there be changes to the local environment because of development or other causes, resulting in diminishing availability of subsistence foods, due to changes in quality or quantity, the local population could well experience serious food shortages, because of their dependence on subsistence.
- Likelihood of damage is reflected in current annual subsistence harvest and retention of commercial salmon catch, because locals would have to find replacements to that food source if salmon populations were lost or degraded
 - 2004/2005 annual harvest (per ADFG) ranges from 99 pounds per person in Port Alsworth to 592 pounds per person in Koliganek
- Iliamna interviewees indicated that they are experiencing reduced subsistence returns, possibly due to overhunting from guided trips, and additional traffic from development exploration, but in all other villages the interviewees indicated that they had adequate subsistence returns

Current susceptibility, in the undeveloped landscape, is therefore very low, because in the event of a natural disaster or other major catastrophic event, the villagers in the region could rely on stored food and ongoing subsistence activities to provide themselves and their families with healthy food, clean water, and adequate shelter for as long as necessary.

If, however, development of any kind incurred damage to the status of the quality and quantity of subsistence food species, including salmon, or to the quality and quantity of water, and or to the overall health of the ecosystem, the villagers would become highly susceptible to future hazard events, because they would not be able to supply their own healthy food and clean water from the local environment.

b. Seasonal Subsistence Round

- While subsistence technologies have changed, and a cash economy (commercial fishing) now provides partial support for the subsistence lifestyle, enabling the purchase of snow machines and other equipment, the basic subsistence seasonal schedule has been approximately the same for hundreds and probably thousands of years.
- Loss of subsistence would completely change the seasonal round, which would change the current culture significantly.

The current rate of susceptibility to hazard events is therefore very low in the undeveloped landscape. The villagers are currently very prepared, because they have both the modern technologies such as snow machines, and also the knowledge of the traditional non-mechanized technologies such as the use of sled dogs, through their cultural traditions, to continue the seasonal subsistence round, and supply themselves and their families.

The rate of susceptibility would be very high, however, if development in the region were to precipitate a loss of subsistence, either in quality or quantity, or were to impact the seasonal round of activities. If a hazard event occurred, the population would be much less able to provide their own healthy food and clean water, as they have traditionally done for thousands of years.

c. Wage Income/Poverty Rate

- Based on 2010 U.S. Census Data, 4.0% (Port Alsworth) to 44.5% (Nondalton) of the residents in the study area communities have wage incomes below the poverty level. The weighted average for all communities (excluding Pedro Bay) is 17.1%.
- Compares to 9.1% rate for AK & 15.1% for the U.S. (DeNavas-Walt 2011, p.14), representing a high level of economic susceptibility to loss of salmon/subsistence resources.
- Assistance for the poor is relatively strong, because of high levels of government assistance programs provided to Alaska Natives and other rural Alaskans. Those related to replacement of lost salmon/subsistence resources include food stamps and heating assistance, and Temporary Assistance for Needy Families (TANF).

The rate of susceptibility to hazard events is currently very low, despite the statistically low income levels, because the high amounts of subsistence foods in the diet buffers the impact of poverty on the communities. The quality of life measured in quality and quantity of nutritious food consumed is not quantifiable at this time, but all interviews and observations of the researchers indicate a high level of nutrition and access to nutritious foods. The informal

economy, which is not measured in dollars, but in freezers full of food, subsistence records, time spent with family, and other cultural information, is strong in this region, offering a much higher quality of life than is indicated by poverty statistics.

The rate of susceptibility would be very high if there were a loss of these critical subsistence resources, or diminishment of their quality, due to development in the region.

d. Economic Capacity and Income Distribution

Sharing food is one of the most important cultural values for both Yup'ik and Dena'ina (interviews, 2011). Income distribution shows some typical skewing, with several higher income families in most villages and many lower income families. It is important to recognize, however, that the cultural practice of sharing subsistence foods serves as a leveling mechanism, reduces disparities to some degree through redistribution of resources, and creates a safety net for families and older people in need. Within some extended families, one person may have a job, and use the income to buy a boat which several relatives can use in obtaining subsistence foods (Terry Hoefflerle, pers. comm. February 16, 2012). If companies that require day jobs with regular hours throughout the year, or the common Alaska pattern of two weeks on, two weeks off, become major employers in the region, the disruption to the subsistence economy, which requires a more flexible schedule, may well put lower income families and elders at risk for adequate nutritious food. Some companies do allow time off for subsistence activities, which could be an important factor for job stability and retention in this region. The economic section of the Bristol Bay Assessment provides a deeper analysis of the economic capacity.

The risk of susceptibility to hazard events if there is a loss of subsistence foods, due to the diminishment of either the quality or quantity of healthy food available, will be very high,

particularly for the elderly, the ill, and families with young children who benefit especially from shared food now.

e. Public infrastructure

Currently the susceptibility of the Yup'ik and Dena'ina population is quite low, due to the rich resources of the Bristol Bay environment, and the thousands of years of traditions of developing coping skills specific to the region and adaptation to this environment, combined with some modern innovations. Villages visited had a community hall/village offices, a school, school fuel tanks, school generator, an airport, a landfill, a clinic, a store, a cemetery, and a church (Lake and Peninsula Borough, 2009: all). All of the villages in the region have access to the hospital at Kanakanak, many have clinics, and there are community health aides in 27 villages, including the study villages of Koliganek, New Stuyahok, Ekwok, Igiugig, Levelok, Kokhanok, King Salmon, Nondalton, and Pedro Bay (BBAHC Bristol Bay Service Area, 2006). New Stuyahok and Newhalen have completed the Rural Utility Business Advisor (RUBA) process in order to join the Alaska Rural Utility Collaborative (ARUC) and have a municipal water system (<http://www.anthc.org/cs/dehe/sustops/>). Nearly 100% of the population has access to some improved sanitation, and 100% of the population has access to the abundant fresh, clean water of the rivers and lakes. However, if large mines are developed upstream from the villages, or in the watersheds of the streams and rivers, the susceptibility of the villages in relation to water will be high, due to the risk of water contamination by the mines.

2. Physical and Mental Well-being

• a. Nutrition

- Nutrition levels are high in the villages (interview of community health aide from Nondalton, 2011)
- As discussed in Section III.C.3., nutrition levels are currently very high in the villages because wild salmon and other fish comprise a very high proportion of the diet and processed foods a lower proportion.
- In addition, the community social systems promote food-sharing, a practice that helps to ensure that others have enough food. Tbl 6 presents the rates at which community households gave or received subsistence resources, which ranged from 53.8% (Iliamna) to 100% (Igiugig) of households which gave resources and 76.9 to 100% who received them from others (same villages). The weighted average for all communities was 70.3% for giving and 90.4% for receiving.
- Should there be changes to the local environment because of development or other causes, resulting in diminishing availability of subsistence foods, the local population could well experience serious food shortages, because of their dependence on subsistence
 - Loss or degradation of salmon populations/subsistence resources would force local residents to replace that/those food source(s)
 - Low wages (see poverty rates above), so healthful replacements unaffordable
 - Replacement costs (Section IV.B.7.) would be high.
 - Less ability to give food, putting elders and lower income families at greater risk of having insufficient food

Section IV.B.2. discusses the likelihood that the Yup'ik population of the Bristol Bay region has an interdependent relationship, nutritionally and possibly evolutionarily, with the

local wild salmon populations. The implications of co-evolution of the human population with environmental food availability mean that hypotheses about the risks of significant changes to the salmon population are important. If a human population has adapted genetically to particular diet such as wild salmon from the immediate area, the fit between environment and population may not be transferable to other places.

Therefore under current conditions, the current susceptibility of the population in relation to nutrition is very low, but if a development of any kind diminished the quality or quantity of subsistence foods, the susceptibility would be very high; the population would risk malnutrition. This malnutrition could be particularly serious because of the possibility of a genetic adaptation to a high salmon intake. The removal of salmon from the diet would remove its protective advantage, leaving the population more susceptible to serious health problems including metabolic diseases, and potentially, greater risk of heart disease, depression, and diabetes.

b. Fitness

- Sec'n IV.B.4. discusses the role of subsistence in the fitness levels of local residents
- Loss of salmon/subsistence resources would either require villagers to find other means of maintaining fitness or lead them to become more sedentary.

Susceptibility in relation to fitness in the event of changes to subsistence is harder to predict from the information available. It is clear that much subsistence activity would be lost in the event of a reduction of subsistence food availability in the environment. This loss of healthy outdoor activity in the company of family and friends would be likely to increase risks of impacts on physical and mental health, unless other healthy outdoor activities were successfully substituted at the same time.

c. Disease Prevention

- Sec'n IV.B.5. presents positive findings in Yup'ik study population for metabolic syndrome, HDL cholesterol, triglycerides, cardiovascular health, & obesity-related disease (Sec'n IV.B.5.) that are unexpected given obesity rates
- These positive findings are most likely based on the population's high intake of omega-3, which also has proven benefits for mental health
- The most common metabolic syndrome components/risk factors in study population were increased waist circumference and elevated blood glucose.
- The higher prevalence of metabolic syndrome among Yup'ik women derives primarily from their large waist circumference, suggesting central body fat accumulation.
- Further increases in metabolic syndrome risk factors among Yup'ik Eskimos could lead to increases in the prevalence of type 2 diabetes and cardiovascular disease, "once rare in this population." (Boyer et al., 2007:2535-2540).
- While one might assume that any salmon would provide a similar omega-3 benefits, a Norwegian study showed that farmed salmon did not contain the fatty acids in the same beneficial quantities as wild salmon (Sincan, 2011). The loss of the local wild salmon as a large component of the Yup'ik diet would result in risks to the physical and psychological health of the population, including greater risks of cardiovascular disease, type II diabetes, and depression.
- Could also put villagers at risk for greater anomie and depression, if they lose some of the deep connections they currently have to their culture and the landscape. Socioeconomic

studies on Arctic regions, where indigenous populations have experienced oil and gas developments, show similar impacts on the population in general (Haley et al., 2008:9).

The level of susceptibility for the Yup'ik population is extremely high, if there were a reduction of subsistence foods, especially salmon, in their diets. Paradoxically, the strength of their long term adaptation to their local environment, while giving them nutrition, fitness, and health advantages in the current conditions, makes them more susceptible to the loss of nutrition, fitness and health if the subsistence foods, and in particular salmon, diminish in their diets. The same may be true for the Dena'ina, but less research is available at this time.

d. Drinking Water

- 100% of the population has access to the abundant fresh, clean water of the rivers and lakes, some of the best in the world
- The villages Iliamna, Levelock, Pedro Bay, and Port Alsworth, as well as some residents of Ekwok, rely on individual wells (DEC Drinking Water Watch <http://146.63.9.103:8080/DWW/>), which the Alaska Department of Environmental Conservation does not monitor, resulting in a high likelihood of damage in the event that the hazard event (i.e., degradation or loss of salmon or habitat) occurs as a result of contamination of surface or groundwater sources.

Even in the communities with public drinking water systems that would, presumably, detect contamination of the source (Dillingham, Ekwok, Igiugig, Kokhanok, Koliganek, Newhalen, New Stuyahok, and Nondalton), the susceptibility to drinking water impacts is still high, due to the costs that would arise from providing additional treatment.

d. Poverty and Dependency

In the event that salmon and other subsistence resources are compromised, either through lower numbers of returning salmon, or contamination and thus inedibility, or through loss of habitat, the diminishment of resources that people share is likely to weaken the sharing networks through the extended family system.

3. Traditional Ecological Knowledge (TEK)

The thousands of years that the Yup'ik and Dena'ina have lived off the land and waters in the region have given them a depth of understanding, knowledge of the local ecosystems, patterns of wildlife movement and weather, and technical skills in harvest and preparation that make these villages some of the best places in the world to be in the event of a disaster.

- Loss of salmon/subsistence resources & subsequent change in lifestyle would alter applicability of current TEK & alter nature of future accumulation of TEK, although the process could, presumably, continue in some form.

The rate of susceptibility in TEK would be very high even within the first generation, as young people lost the connection to the landscape, and lost TEK learning opportunities because of diminishing or nonexistent opportunities for hunting, fishing, and gathering with the elders and culture bearers, those who know the local ecology well.

Not yet adequately measured by the World Risk Index, Traditional Ecological Knowledge provides another strength in the villages in case of disruption or disaster. The thousands of years that the Yup'ik and Dena'ina have lived off the land and waters in the region have given them a depth of understanding, knowledge of the local ecosystems, patterns of wildlife movement and weather, and technical skills in harvest and preparation that make these

villages some of the best places in the world to be in the event of a disaster. The knowledge base in the communities would ensure that if wild food were available in the landscape, the people would have access to it. If shelters were needed, they would know how to build them from available materials, and how to gather firewood for heat. With the existing framework of extended families and church communities, they would take care of each other.

In summary, if all economic and social networks are taken into account, including the noncash economy and the widespread practices of sharing subsistence foods among extended families and friends, as well as the depth of Traditional Ecological Knowledge present in the Yup'ik and Dena'ina cultures, the susceptibility of the Bristol Bay region under current circumstances is very low. If, however, certain factors changed, for example if the health of the waters and fisheries was diminished, or the time available for those in their most productive years, e.g. 15-65 year-olds, to participate fully in subsistence activities decreased, the susceptibility of the Bristol Bay population to negative effects from disasters could rise substantially.

4. Social Relations

a. Sharing and Generalized Reciprocity

- Long-established practice in Yup'ik and Dena'ina cultures (see the discussion under Modern Cultures)
- Besides providing food to others, sharing also promotes altruism and a sense of solidarity and belonging to community and maintains strong extended families and social bonds

- Loss of salmon/subsistence resources or degradation to the extent that it requires greater dependence on wage income could seriously undermine this practice and the social/cultural benefits thereof
- It could also reduce the relevance of *beggesha*
- The cultural level of susceptibility for the loss of sharing practices is relatively high. It is possible that people could shift to other items to share, but these would be neither so meaningful, nor are they likely to be as healthful. In addition, since they would have to be bought, rather than hunted, fished, or gathered, it would not be as easy to share.

b. Fish Camp

- Both Yup'ik and Dena'ina have a long tradition of going to fish camp
- This cultural tradition also strengthens family bonds and also friendships
- It provides a mechanism for passing on TEK, including respect for nature
- Degradation/loss of salmon would jeopardize/eliminate this practice, thus undermining social & educational benefits it provides
- The level of susceptibility would be very high, if the salmon were lost, or diminished greatly, or if their quality were compromised, and the family traditions of fish camp could disappear in one generation.

c. Gender and Age Equity

- Gender equity balanced in subsistence lifestyle
 - The importance of women in managing the salmon preparation at fish camps.

- The importance of women as distributors of food-wealth in the extended families
- The centrality of women in the extended family groups that form the backbone of all the villages.

The roles of women are important in all aspects of village life. In the subsistence economy in the Bristol Bay region, the collection of food through hunting, gathering, and fishing forms a substantial part of the economy, although not monetized. In this economy, men and women are equally valued, necessary partners in a balanced system of harvest and preparation.

- Loss of salmon/subsistence resources could alter gender equity by eliminating or reducing importance of fish camps, food sharing, extended families

Socioeconomic studies on Arctic regions, where indigenous populations have experienced oil and gas developments, show similar impacts on the population in general (Haley et al., 2008:9).

- Elders are considered important members of community

The loss of salmon and other types of subsistence could change their social status for many reasons. Their knowledge of the ecosystem, and stories about it, and how to hunt, fish, and gather, are what they have to share. If these become irrelevant, because there are fewer subsistence activities taking place, their sense of their role in the community, and their extrinsic value in the community will diminish. Their susceptibility would be very high

d. Wealth

- Current majority view of wealth equates it to having abundant subsistence resources and the freedom and strong family and social ties that go with it
- Many currently look on wage employment with disdain
- The loss of salmon/subsistence resources could change that view, pitting local people against each other, as some have jobs and those who do not, cannot improve their living with subsistence resources any longer.

The susceptibility could be relatively high in relation to wealth, but more importantly, any change in valuing wealth, because subsistence was insufficient, tends to cause a loss of pride in local culture, and rather than a sense of satisfaction and happiness, it can create a sense of need or increased feelings of poverty, as young people in particular compare themselves with people in urban areas who make more money. This process of loss of pride in culture and satisfaction with the culture and contemporary traditional exists around the world in traditional cultures where large-scale development and the conversion to wage labor has occurred.

e. Dependency Rates

The WRI defines the age dependency ratio as the share of under 15- and over 65-year-olds in relation to a study area's "working-age" population. The U.S. Census sets the threshold for the youth component at 18 years of age and defines the elder component as 65 and older, rather than over 65. The age dependency ratio totals the proportion of the population within the youth and elder age groups and divides that total by the proportion of the population within the "working age" group (18-64 years old). For the communities of the Nushagak and Kvichak River

drainages, the proportion of youth counted in the 2010 census ranged from 29.4% (Dillingham) to 42.1% (Koliganek) of the community's overall population, while the 65-and-over population ranged from 2.9% (Levelock) to 11.9% (Pedro Bay). The weighted averages were 32.5% for youth and 7.1% for elders. The average proportion of the youth population was much higher in the study area communities than in Anchorage (26.1%), Alaska (26.4%) or the country, as a whole (24.0%), while the elder population was similar to both Anchorage and Alaska (7.2% and 7.7%, respectively), but much lower than for the U.S., as a whole (13.1%).

In terms of the "age dependency ratios," the population component figures for the study area communities translate to a 54.5% rate of youth dependency, 11.7% for elders, and 66.2% overall. These rates compare to 38.9% for youths, 10.8% for elders, and 49.7% overall for Anchorage (<http://quickfacts.census.gov/qfd/states/02/0203000.html>), 40.0% for youths, 11.7% for elders, and 51.8% overall for Alaska, and a youth dependency rate of 38.2%, an elder dependency rate of 20.7% and an overall age dependency rate of 58.9% for the country (<http://www.census.gov/compendia/statab/2012/tables/12s0017.pdf>).

- The study area has dependency rates similar to Anchorage & AK for elders, but much lower than in the U.S.; much higher than all for youth & overall.
- Likelihood of damage is reflected by the percentage of the population that depends on the "working age" population for food provided through subsistence.

The villagers could have low or high susceptibility in relation to the dependency rates should there be a change in subsistence. On the one hand, young people could begin leaving home earlier to find wage labor, and on the other hand, they could, as some elders told the researchers, become lazy and not help the family with

subsistence tasks if these were severely diminished, while still living at home.

Current dependency rates do not reflect the degree to which young people help with subsistence tasks as productive members of their families.

5. Spirituality and Values

a. Respect and Thanks

- Current beliefs stress importance of treating animals and nature with respect and thanks.

The level of susceptibility related to these beliefs, if there were a potential loss of salmon/subsistence resources because of human-caused conditions that degraded the habitat or diminished the fish and wildlife, would be very high. Some elders wept at the thought of it (interviews, 2011).

b. First Salmon Ceremony

- When the King Salmon come upriver in the spring, and early summer, the people share the first fish they catch with all of their family, especially the elders. This ceremony is important all across the salmon cultures of the Pacific Northwest and Alaska.

If the salmon were diminished in quality or quantity, the First Salmon Ceremony would lose its meaning and an important part of the culture would be lost. The symbols and even the language of the populations would suffer erosion of cultural meaning if there were a potential loss of salmon/subsistence resources

c. Great Blessing of Waters

The Great Blessing of the Waters occurs each year in January at Epiphany, when priests and the Bishop of the Russian Orthodox Church bless the waters, invoking their pure essence once again as a source for healing waters. This ceremony is at the core of the Yup'ik and Denai'ina Russian Orthodox believers, and incorporates some elements of traditional spirituality. The level of susceptibility to loss of spiritual meaning based on potential loss of salmon/subsistence resources and the clean water of the rivers, streams and lakes would be very high.

E. Coping Capacity

To assess the ability of a region to reduce the negative impacts of an event through direct response, the WRI considers five indicators: government and authorities (unemployment rate, effectiveness of government); disaster preparedness; availability of medical services; strength of social networks; and “material coverage” (diversification of household income, land ownership, income per capita) (Birkmann et al., 2011:37). All of the indicators apply.

a. Government and Authorities

- Unemployment rate
 - Ranges from zero (Igiugig, Iliamna, Pedro Bay and Port Alsworth) to 31.1% (Koliganek)
 - Weighted average is 10.9%; compares to 8.0% for Alaska and 9.6% for the U.S. (<http://www.census.gov/compendia/statab/2012/tables/12x0629.pdf>)
 - Unemployment rate may not fully reflect the capacity to cope with the loss of subsistence resources, since it includes only people actively seeking traditional

employment and there does not include villagers who consider subsistence to be their employment.

- Percentage of working-age population “not in labor force”
(http://www.bls.gov/cps/cps_htgm.htm#nilf) may better reflect how many people might seek employment should subsistence salmon/other resources no longer be available.
 - Ranges from 16.3% (Dillingham) to 56.9% (New Stuyahok); weighted average is 26.9%; compares to 35.3% for U.S. (http://www.bls.gov/cps/cps_htgm.htm#nilf).
 - Assign coping capacity for loss of salmon/subsistence resources
- Effectiveness of Government

Villages operate under a complex set of interrelated government entities, including Federal, State, Tribal, ANCSA Corporations, and informally, the village elders. Some villagers feel they have little control locally over their own land base (interviews 2011). The tribal governments do not have jurisdiction over their lands, unlike tribes in the rest of the United States who may actually implement their own EPA-delegated programs which allow them to set their own water quality standards. The tribal governments cannot set permit conditions and do not have decision-making authority in these issues, although they will affect the quality of life in the villages. Yet the local people themselves from villages across the region find strength in working together on issues related to their shared environment. In October of 2011, with 57% voter turnout, the Lake and Peninsula Borough counted 280 votes for and 246 votes against a ballot initiative targeting the Pebble gold and copper mine that “will give local areas control

over the mine’s permitting process. . . if the initiative is [upheld] in court, permits could not be granted for any large-scale resource extraction activity – including building roads and bridges that would assist in such extraction – that would impact salmon-producing streams” (Coyne, 2011). The Pebble Partnership is contesting the vote. “The Alaska Department of Law, which filed a brief in support of Pebble’s quest to keep the initiative off the ballot by claiming the effort violated the state’s constitution, will appeal the vote, as will the Pebble Partnership” (Coyne, 2011). In another example of inter-village coordination, 6 tribes came together to ask EPA to consider a 404(C) ruling, and additional tribes signed on. Not all villagers agree, but data from the 2011 EPA Bristol Bay Traditional Ecological Survey found that a strong majority of interviewees concurs that their communities do not want large-scale mining development in the Bristol Bay region. These findings match the data from the Cracion Surveys in 2011, and the Bristol Bay Native Association survey, which both found that well over 80 percent of the local population did not want large mine development in the region. Many village elders in the EPA interviews cited examples from their traditional ecological knowledge of the salmon and wildlife to support their opinions.

The government and authorities in the village continue to show a high regard for the opinions of a diverse group of elders, even as diverse formal authorities, including tribal councils and city mayors, create formal decision-making channels to cope with demands from outside the village, as well as day-to-day infrastructure needs. Collective decision-making and consensus-based processes still occur in many or most villages.

In contrast, villagers are well aware of the governance issues at the State level, including awareness of corruption of state officials. Alaska had the 5th highest rate of guilty officials per capita in the United States in 2008 (Marsh, 2008). In the 2012 preliminary corruption risk scores from State Integrity Investigation, a funded project of the Center for Public Integrity, Global Integrity, and Public Radio International, Alaska was ranked “weak” on the following indicator, “In practice, the regulations restricting post-government private sector employment for governors and/or state cabinet-level officials are effective.” While the United States ranks high in anti-corruption safeguards, the Global Integrity Report (2009) states: “the United States continues to struggle with controlling the corrupting influence of money in politics. . . the U.S. sets the standard globally for the volume of private money flowing into the political process on an annual basis.”

A majority of the local governments have already chosen a proactive role in responding to the potential loss of salmon and subsistence resources

The level of coping capacity would be high at first, as local and regional governments banded together to address any threats to their environment, but it is possible that if their actions did not prove effective, the local people would lose confidence in their government, and coping capacity would go down.

b. Disaster Preparedness and Early Warning

For this assessment, the disaster in question would be a food shortage resulting from the loss of subsistence salmon resources, a loss of other subsistence foods or wood heating sources, or an inability to consume subsistence foods including salmon due to contamination.

Additionally, a disaster involving water contamination could result in unusable drinking water,

and sedimentation that prevents or disrupts adequate water flow. Long term rises in cancer rates due to consumption of contaminated food and water, as has happened in other copper (Utah, Upper Peninsula Michigan) mine locations has multiple effects on the health and economy of communities.

Actual levels of material disaster preparedness is difficult to measure at this time, but the customary preservation of large amounts of subsistence foods in freezers and in dry storage, and the widespread practice of sharing subsistence foods would suggest that short-term preparedness for the potential loss of subsistence food sources is currently very high. The TEK base in the communities and coping skills developed over thousands of years of living in this harsh environment would ensure that, if wild food, as well as heating and building materials, were available in the landscape, the people would have access to it. With the existing cultural framework of strong extended families and church communities, affected communities would take care of each other (See Sec'n. on Social Relations).

- But long-term preparedness for disasters would be much lower if subsistence foods became less available, thus converting a highly prepared community into a minimally prepared community, isolated from other food sources besides wild foods, since all other foods must be flown in or brought by boat, and are expensive due to the added fuel costs. The current level of coping capacity for long term preparedness for disasters is quite high in most aspects, but this could change drastically in the future if the population could no longer count on subsistence foods and clean water.

If different forms of employment, which detracted from the capacity of the culture to practice subsistence fishing, hunting, and gathering and to pass on TEK, became the primary work in the communities, future levels of disaster preparedness would potentially be much lower.

Medical services, measured in terms of doctors, health professionals, and clinics or numbers of hospital beds, appear to be sufficient and at a high standard of service. Many villages have new clinics, as well as regular visits from medical professionals, and have trained medical paraprofessionals living in the villages, as the researchers witnessed in their visits to the communities. The Community Health Care Providers are trained and work at a level that has made their program an international model. In addition, traditional herbal medicines and elders who understand their uses and applications are available in many of the villages (Russell Kari; interviews 2011). Sometimes people have to travel to Anchorage for more specialized care. The interviewers heard about one man who had to spend extended periods of time in Seattle for care only available there. The extended families and close community of the villages provide some measure of support for mental health, as well as a source of family members as care providers when someone is ill, either temporarily or over a long period of time.

d. Social Networks

Belonging is a central feature of village life. The villages have a number of informal cooperatives and other social organizations, which became obvious during the research visits, including church groups, maqi steam bath groups, extended family, hunting, fishing, and berry-picking groups, fish camp groups, and other more formal organizations. Extended families provide both material and emotional support for family members in all villages and frequently

reach well beyond the village to provide support to relatives and friends who live elsewhere in the region. Children working or at school in Dillingham, Anchorage, or other cities also receive support and assistance from the extended family at home in the village. The churches provide a second support network, both material and emotional; both Russian Orthodox and Protestant churches exist in the villages and provide a dense network of social support, professional support from the clergy, and material support in times of need. Funerals, weddings, baptisms, and other ceremonial needs are presided over by the clergy, who provide spiritual support in these critical transitional times. Other groups include subsistence harvest partners, such as the groups of women and girls who regularly gather wild plant foods together and the steam bath groups. Formal organizations, including the public school, the Village Tribal Council, nongovernmental organizations, and other entities overlap with and gain strength from the informal social organizations

. e. Material Coverage

For short term coping with large-scale disasters, primary needs will include clean fresh water (an average of 13 gallons per person per day minimum for all needs), nutritionally adequate food, shelter, access to medical treatment and supplies, and particularly in Alaska, adequate clothing. Using these requirements as a yardstick, at present all the villages along the rivers and lakes and coastal areas in the Bristol Bay region can meet these standards.

- Diversification of Household Income

Village households currently have access to diversified informal incomes in the form of subsistence hunting, fishing, and gathering. This diversity provides some capacity to cope with

the loss of any one subsistence resource. They also have access to the abundant clean water. In essence, while not in material currently valued in dollar amounts, in almost all interviews, the interviewees indicated that the material security of the population of Bristol Bay is very high.

- Loss of salmon would be most difficult due its relative prominence in current household harvests (see Table 11 and Table 12).
 - The overall diversity of household income, is available on the Alaska Community Database sites
http://www.commerce.state.ak.us/dca/commdb/CIS.cfm?Comm_Boro_name=Dillingham et al., under “additional ACS information”).
- Land ownership in the region is complex and includes village corporations, the Bristol Bay Native Corporation (BBNC), Native allotments, the federal government (both the National Park Service and the Bureau of Land Management), and the State of Alaska, sometimes with overlapping boundaries. In some situations, the village corporations own surface rights, while the BBNC owns the subsurface rights on the same parcels. Because the Yup’ik and Dena’ina have, for thousands of years, managed the region’s lands as a commons that provided for everyone (see section III.B.3 on State and Federal management of subsistence), overlapping Native ownerships offer the possibility for negotiate different needs in collaborative decision-making, a process they traditionally followed and continue to practice.

Additional ownerships provide opportunities and challenges. The Federal Government, and therefore the people of the United States, own the National Parks, the Lake Clark National Park and Preserve, and Katmai National Park and Preserve. The

people of the United States, through the Federal Government, also own and manage the Bureau of Land Management lands. The State of Alaska owns and has jurisdiction over State lands, including the Wood TikChik State Park and those where exploratory mining is taking place. Because these latter parcels are adjacent to and will potentially impact the federal lands if they are developed for mining purposes, the Federal Government may exert authority over the uses and management of the State lands as well due to perceived or actual risks to Federal lands.

- **Per Capita Income**

Currently, the income per capita both in cash and in subsistence products in the region is relatively high, because of the fish populations, and the conservation of the clean water they need for habitat, the tundra/taiga ecosystems and their plants and wildlife. However, if the fish populations were to diminish substantially, or if perceived or actual contaminants compromised their value and utility, the villagers would be forced to depend more exclusively on their cash income per capita, a significantly lower income level, as detailed in previous sections.

F. Adaptive capacity

For this category, the WRI assesses the ability of a society to implement changes that could render the need for future coping capacity less critical (Birkmann et al., 2011:17). It measures five indicators: education; gender equity; environmental status/ecosystem protection; adaptation strategies; and “investment” (health expenditures, life expectancy) (Birkmann et al., 2011:19). We have addressed gender, along with age, equity in the sub-section above on Susceptibility.

a. Education and Research

The adaptive education and research capacity is currently strong in the Bristol Bay region, because the region has adequate resources both in TEK and in the Western formal education system. TEK is available to young people through the elders and culture bearers in their society.

Alaska state law mandates that all children between ages 7 and 16 attend public, private or home school. All but one of the villages has a school; students who live in Iliamna attend school in Newhalen, 4.5 miles to the southwest and accessible by road. Ekwok's school goes only through grade 8. At least 18 students homeschool in the Lake and Peninsula Borough (Lake and Peninsula School District Personnel, interviewed 2012). While Pedro Bay, with a total population that is well below 100, has only homeschoolers, the other schools contacted in the study villages indicated a steady rate of enrollment over the last several years, or a slight increase, as of January 2012.

- The percent of the population at least high school diploma is 91.4 for AK & 85.3 for U.S (<http://www.census.gov/compendia/statab/2012/tables/12s0233.pdf>). Further research may show equivalent data for the Bristol Bay area. At present, data from the village schools in Lake and Peninsula Borough show the 7th-12th grade drop-out rates for the schools for this year, and these are low. For example, although Igiugig has a high dropout rate of 16.7%, but Newhalen has only a 5.3% dropout rate, and Levelock, Nondalton, and Kokhanok all record a 0% dropout rate this year.

After completing high school young people can attend college in the region, at the University of Alaska Fairbanks branch in Dillingham, or must go elsewhere. The University of Alaska's Bristol Bay Campus offers both two- and four-year degrees, as well as Certificate programs, in a variety of disciplines that could increase the capacity of the region's residents to adapt to change, including entrepreneurship, tourism, rural development, renewable resources, and a variety of business and computer subjects. The university offers a master's degree in rural development.

Research programs in the area are numerous, as are outside partners who bring in support and expertise they can share. The research programs include those of the Nature Conservancy, fisheries research, University of Alaska-led projects, research through Lake Clark National Park and Preserve, and many other programs. Much of this research is conducted in full collaboration with local people.

Education is an important aspect of adaptive capacity. The adaptive capacity of the population in relation to education in the face of change seems to be high; by drawing on both traditional ecological knowledge systems based on experiential learning about their ecosystem, learning from elders, and learning in the formal school system, both Yup'ik and Dena'ina have shown themselves able to mobilize, educate themselves, and act on the basis of their knowledge in the face of the current plans to bring large-scale extractive mining development to their region in spite of the opposition of the majority of the Bristol Bay Native Corporation, and citizens voting in the Lake and Peninsula Borough.

Gender Equity

It is beyond the scope of this assessment to do a full analysis of gender equity in the event of large-scale development in the region, particularly resource extraction, but previous studies of other areas where resource extraction has taken place in rural areas have shown that women are often differentially affected by the conditions of development. As in the case of any funded project promoted by the United States Agency for International Development, an examination of gender equity issues is important for researching and remediating any potential gender inequities in access to resources, land, labor, cash, credit, and opportunities that large-scale development might create. Examining the existing traditional cultures in the absence of large-scale extractive industry development reveals:

- The importance of women in managing the salmon preparation at fish camps.
- The importance of women in the churches as lay readers and leaders in the congregation
- The importance of women as distributors of food-wealth in the extended families
- The role of midwives and other health care providers as support networks
- The centrality of women as mothers, sisters, daughters, wives, and in-laws in the extended family groups that form the backbone of all the villages.

The roles of women are important in all aspects of village life. In the subsistence economy in the Bristol Bay region, the collection of food through hunting, gathering, and fishing forms a substantial part of the economy, although not monetized. In this economy, men and women are equally valued, necessary partners in a balanced system of harvest and preparation.

The Dillingham Borough is addressing issues of violence against women through its women's shelter, SAFE, and also through participation in a research grant led by Andre Rosay et al. (2008) of the Justice Center at the University of Alaska Anchorage. Preliminary results will

be available soon. Unfortunately, the trend may be for rates of assault, domestic violence, and forcible rapes to go up when extractive industries move into a rural area in Alaska, bringing temporary workers from outside the region.

The amount of subsistence foods that mine workers bring home to the community may decrease over time; the central role and respect within the communities that women have as a result of their critical importance to the informal subsistence economy may therefore also diminish, if their subsistence work is not fully replaced by jobs in the mining sector. This loss of productive employment would reduce their central importance in the economy of the village and could put them at greater risk for domestic violence, as well as reducing their personal means for strengthening their support networks in the village, according to Ginger Baim, Executive Director of SAFE, Dillingham (pers. comm. 2/14/2012) . It could also put them at risk for lower sense of self and community, or anomie, and depression, if they lose some of the deep connections to culture and the landscape through lowered productivity and less integration with the central relationships with the wild salmon, the caribou, moose, bear and other wildlife there. Socioeconomic studies on Arctic regions, where indigenous populations have experienced oil and gas developments, show similar impacts on the population in general (Haley et al., 2008:9).

b. Environmental Status/Ecosystem Protection

A community's ecological footprint and an area's land and natural resource management practices are indicators of adaptive capacity because intact ecosystems can serve as "natural bulwarks" against hazards (i.e., sustainable natural resource buffers a community against future losses; Birkmann et al., 2011:22,37; Birkmann, 2006:22).

- Yup'ik and Dena'ina villages of the Bristol Bay region are currently surrounded by intact ecosystems
 - Some of the Nushagak and Kvichak River watersheds are protected in national parks and preserves (Katmai, Lake Clark), a national wildlife refuge (Togiak), and a state park (Wood-Tikchik)
 - There is Native ownership along much of main waterways/waterbodies (Wood, Nushagak, Kvichak, Iliamna Lake, Newhalen River)
 - Remainder primarily BLM or State land, which is mostly open to mineral leasing (http://www.blm.gov/pgdata/etc/medialib/blm/ak/afo/bay_rmp_eis_final.Par.6318.8.File.dat/Map2-13_LeasableMineralsAltDBBay.pdf)
- Water rights (protection of water resources other than through parks, etc.) have been difficult to achieve (interviews 2011) for local people. Despite the fact that the indigenous people have lived here and used the waters for over 4000 years, the rights to water through state permit are easier for large scale extractive corporations to obtain than for villages or local communities. In fact, the large scale mining company most active in seeking permitting in Bristol Bay is ahead of Dillingham in line for water rights from the state, although both applied about eight years ago (interviews 2011, Dillingham).
- Residents currently practice sustainable use of salmon and other natural resources dependent upon the clean water in the region, a use that derives from the thousands-year-old subsistence lifestyle that is, by definition, keyed to sustainable use of water resources.

- TEK reflects awareness of that fact and is based on spiritual connection to the landscape (interviews 2011) that include the importance of respecting the fish and animals and giving thanks.

Currently the ecological footprint of the indigenous populations in Bristol Bay, the Yup'ik and Dena'ina inhabiting the villages along the rivers and lakes of the region, is very slight compared to many small towns of equivalent size (interviews 2011), because the “industry”, besides some small-scale mining, such as gravel mining, is mainly subsistence fishing and hunting, which only relies on a few outboard motors, four-wheelers and snow-machines. The latter have some impact on the tundra vegetation – tracks which cross the landscape can take years to re-grow the fragile plants of the subarctic tundra. But in most villages a few tracks become the regular roads in and out of the village, and through the surrounding landscape, and other tracks are used much less frequently. Oil is burned for heat, and small airplanes fly in and out of the villages on a regular basis. Beyond this low level of motorized activity, the villages do not host factories or other businesses that tend to degrade the landscape. As discussed in Section III.F., the Yup'ik and Dena'ina cultures focus ensuring the sustainability of the harvest of fish and wildlife, year after year, by treating the animals with respect and care (Nushagak Mulchatna Watershed Council, 2007; Stickman et al., 2003). Villagers also treat the rivers with extreme care, perceiving it to be an obligation, a duty they must not shirk. They speak about being careful not to pull boats up on the tundra so as not to damage it. Keeping the rivers and river banks clean has high importance (Interviews, 2011). The most significant effect of the population on the landscape may be the use of firewood for the steam baths, since trees grow slowly in the subarctic taiga and tundra landscape.

The importance of these healthy Bristol Bay region ecosystems extends to continental, and even world conservation goals, because of the uniqueness of the region, its indigenous populations, its rich and abundant high quality food supply for humans, and especially because of the very large amount of clean fresh water. To the south of the Bristol Bay region, the water supplies of the continental United States are far more contaminated with industrial wastes, agricultural run-off, the number one source of nonpoint source pollution in the United States (EPA 2002, 2003), and urban pollution. These water supplies are currently at risk for potential increases in contamination from urban development and its wastes.

Paradoxically, the Arctic, which is less inhabited, has more pollution than the Bristol Bay Region due to the concentration of persistent organic pollutants (POPS) in the water, and through bioaccumulation in the fish, the wildlife, and in the people themselves (Byrne 2009) To the north of the Bristol Bay region, indigenous peoples living in the far north have the highest levels of persistent organic pollutants in their bodies of any humans. Because of prevailing weather patterns world-wide, snow and rain falling in the Arctic is more contaminated with these pollutants than anywhere else; the local diet with its emphasis on consumption of meat and fish means that as the POPS bio-accumulate in lipids as they move up the food chain, human beings in the Arctic consume high quantities over their lifetimes. As the snow and rainwater wash over the landscape, they feed into rivers and streams, so that what seems to be fresh clean water is very often polluted to an unexpected degree. Thus the Bristol Bay region, further to the south and out of the Arctic zone, with its abundant freshwater provides one of the last best sources of clean water and relatively uncontaminated wild foods for the United States.

Tribal councils in the region employ at least one, and sometimes two, environmental professionals and have undertaken projects such as collecting baseline water quality data, gathering and documenting TEK, conducting environmental outreach and education activities in their communities, and improving local environmental conditions. Local tribal leaders also participate in national workgroups (e.g., the National Tribal Water Council) that help shape environmental policy for tribal governments.

Currently, the level of adaptive capacity in relation to the environment is high. The villagers appear to be knowledgeable and interested in their environment (interviews 2011) and have survived both extreme volcanic events and earthquakes. A loss of salmon and clean water, and damage to the environment, would reverse this situation, and put the level of adaptive capacity well below current levels.

c. Adaptation Strategies

To assess this category of adaptive capacity, the WRI considers diversification of the labor market and extent of programs aimed at building capacity. The subsistence economy, although not measured directly in dollars, contributes significantly to the labor market, and includes youth, elders, and women in its work force.

The following data is available in the economic section of the Bristol Bay Assessment: characterization of the current wage income labor markets in the communities, including commercial fishing, and other industries and employers.

There are abundant opportunities for future diversification of the labor market. For instance, the arrival of some of the best high speed internet in Alaska in the villages will bring additional diversity to the labor market offering the potential for online jobs in which people can

work from the village. The Bristol Bay Campus and other branches of the University of Alaska offer extensive training in computer skills, ranging from the basics of internet research to desktop publishing. Online jobs will not damage wildlife habitat or interfere with the environment in ways which would damage subsistence resources. Villagers are also exploring other ways to diversify local labor markets, including health-related retreats and camps, wilderness activities and support services for the region's parks, refuges, and other natural attractions, internet marketing of Native crafts and increased commercial fishing (interviews and observations, 2011).

There are currently no adaptation programs related to loss of salmon known to this researcher.

While people in the villages are generally well educated about their landscape (interviews 2011) through informal and experiential learning, and look to the elders and culture bearers for additional information, this knowledge is specific to the local landscape and to the species that inhabit the ecosystem. Therefore if development damaged the ecosystem to a level where subsistence was no longer an important part of the diet and life of the people, their level of adaptation would be low. Many interviewees expressed their own sense of this with emotions including fear and distress about the possible loss of salmon as a regular source of food (interviews 2011). It was clear from the interviews that many did not think they could adapt.

d. Health Expenditures and Life Expectancy

As discussed in the section (III.C.) on health, the villagers spend time and effort, as well as making investments in equipment, to provide themselves and their families with subsistence foods as the most important means for preventive health care (interviews 2011). Interviewees

consistently called subsistence foods “healthy foods” in contrast to the “store-bought foods” which were not considered to be healthy. In addition, villagers consistently spoke of subsistence activities as good for mental health, particularly because people are spending time together then, often with friends or family. Thus expenditures of time and effort, as well as cash for boats, nets, guns, and other subsistence equipment are viewed by the villagers as expenditures toward good health. Alaska Native Tribal Health Consortium (ANTHC) and BBAHC provide health care resources for other health expenditures for Alaska Natives and their families, including the Kanakanak Hospital, with over 360 health professionals serving 34 villages (www.bbahc.org). BBAHC manages 29 village clinics including the new clinics in New Stuyahok, Ekwok, and Igiugig. Each village clinic is staffed by at least two resident health aides. Most villagers are provided health care coverage through the Bristol Bay Service Unit for the Indian Health Service, under the Bristol Bay Area Health Corporation and the Alaska Tribal Health Compact since 1994, but some nonnative people in the villages are not fully covered. “Direct control over programs and financial resources allows the corporation to design and provide programs that better meet the healthcare needs of the people and respond quickly to changing trends” (BBAHC, 2012). Travel expenses for health care is sometimes covered, but may involve days or weeks away from the village, and away from family and work, thus incurring other costs not easy to calculate. If rates of cancer increase due to contaminated fish and water, as has occurred in other communities near copper mine sites, for example in Utah and in Michigan’s Upper Peninsula, sometimes decades after the mine began, costs could escalate due to travel requirements for extended specialized care.

Life expectancy in the Bristol Bay Area Health Corporation service area was measured at 69.4 in 1998, still below that of U.S. residents and other Alaskans (BBAHC, 2012), but is expected to continue to increase (Alaska Area Profile Bristol Bay Service Area 2006:68). Cancer, heart disease and diabetes have become the top health issues affecting life expectancy, followed by accidents. Infant mortality dropped below the national rate in 1997. “There is an increased number of cancer patients. These patients utilize a substantial amount of outpatient and inpatient services. Without adequate space at Kanakanak Hospital, more patients need to be transferred to the Alaska Native Medical Center or to other contract hospitals in Anchorage or Seattle” (Alaska Area Profile Bristol Bay Service Area 2006: <http://www.ihs.gov/facilitieservices/areaoffices/>).

In the event of disasters, or accumulating difficulties due to climate change, rising human populations in the range of 9 billion, and escalating food and water costs, gold, copper and other metals may be perceived by outsiders to the region as good investments, though not necessarily to the majority of the region’s Yup’ik and Dena’ina, who put the highest values on their subsistence foods, their clean water, their health and the strength of their family and community networks. In the event of such disasters, wars, or other challenging events that have global reach, gold and copper will only be worth the quality and quantity of healthy food and clean water supplies they can buy. The Yup’ik and Dena’ina already have these in abundance.

G. Summary of WRI Assessment

Using the World Risk Index with the data available, and within the time constraints of this assessment, it is still possible to provide an overall assessment of vulnerability. Currently,

despite the high exposure level in the Alaskan landscape, and particularly the numerous earthquakes and the increased impacts of climate change in the arctic and subarctic regions, the Yup'ik and Dena'ina populations score remarkably low in susceptibility, and remarkably high in coping and adaptation abilities within the communities in the current conditions with no large extractive industries permitted. A large portion of these positive scores are due to the presence of generations and generations of elders and culture bearers passing on Traditional Ecological Knowledge that has helped these cultures to adapt well to this specific and challenging environment. Ecological knowledge, adapted technologies for food harvesting and housing, and long term wisdom have enabled the Yup'ik and Dena'ina to protect the ecosystems which they are part of, as the major investment in their future.

But this current protection against the vicissitudes of difficult hazard events would alter, and the Yup'ik and Dena'ina would become very vulnerable to the same hazards, or to any combination of natural and human-caused hazards, should a large scale mining operation move into the region, potentially reducing the quality and quantity of subsistence foods, especially salmon, and clean water, that are available to the population. Actual poverty and dependencies could increase because the subsistence sector would be likely to decrease substantially over time. Thousands of Yup'ik and Dena'ina depend upon subsistence in the region. Without these subsistence resources, coping capacity and adaptation could diminish rapidly.

While there could eventually be jobs for local people, including possibly several hundred jobs at the Pebble mine for local people during the operating period of several decades (according to comments by John Shively, CEO of Pebble Partnership, made at a speaking engagement at Kenai Peninsula College, 2008), these jobs would disappear after 50 to 75 years.

In the wake of the mining activity, the subsistence lifestyle could be severely reduced due to the factors described in this report. The vulnerability of the population of this region, in the event of the long term loss of clean water and healthy subsistence foods, whether because the quantity is diminished or the quality is compromised by toxins, is very high. Vulnerability includes the physical and mental health and wellbeing of the people, which depends upon access to subsistence. It includes their spiritual unity which rests on the security that the Great Blessing of the Water provides them, sanctifying the clean safe water that is good for them and their families. It includes their value of sharing, which relies upon redistribution of subsistence food resources, and would become less likely to equalize benefits among families, a common after effect among indigenous peoples world-wide, following resource extraction by corporations external to the region. It includes their knowledge of their interdependence with the landscape which they have inhabited for over 4000 years. Adaptation that includes the high levels of mobilization and collaborative work going on in the region now in response to the threat of damage to the water, the fisheries, the wildlife and the recreation use of the ecosystem, as the villagers respond to the activity of mining interests in their region, can be highly positive and result in new information, new organizations, and new connections between groups. Adaptation to change which deeply damages the core values of a culture, and removes raw resources from their landscape, leaving as much as 10,000 billion tons of mine waste at the headwaters of Bristol Bay, in the face of the indigenous people's resistance, is not adaptation, but subjugation to hegemonic resource colonialism.

V. SELECTED CASE STUDIES

A. Overview

In this section we include three case studies, two involve cultures which previously have been heavily dependent on salmon but now have no or limited subsistence access to wild salmon: the Sámi of northern Scandinavia and Finland/Russia and the Ainu of the Japanese island of Hokkaido. Each was severely impacted by loss of subsistence salmon rights along with other assimilation practices of the nations that occupied and claimed their indigenous territories. Moreover high seas fishing, habitat destruction, dams, dewatering and other activities have limited or eliminated wild salmon from their streams. There is little likelihood either will regain a subsistence base in wild salmon.

The third is a case study of the Yonggum people of New Guainia who occupy a wet environment with food resources based on the Ok Tedi River. The Ok Tedi Mine slated to close in 2012 has been the source of toxic river pollution since the 1980s in the course of gold and copper mining.

B. Sámi of Fennoscandia

The Sámi (Saami, Sami) of northern Fennoscandia are an aboriginal ethnic group who retain an identity that can be traced back to prehistory (Sara 2002:2). The Sámi define ethnic membership on the basis of either speaking the language or having a parent or grandparent who speaks Sámi (Sara 2002:15-6) and on this basis today there are 84,000 Sámi in Norway, Sweden, Finland and Russia. Because of policies such as Sweden's late-nineteenth and early twentieth century "segregation and isolation" policy, Sámi have been stereotyped as reindeer herders and many in North America still think of Sámi in this way (Lehtola 2004:10, 45-6). Reindeer pastoralism is relatively recent, however, and is still important in certain areas of Sámi

territory. But the Sámi have traditionally had complex subsistence patterns that reflect adaptation to various ecosystems of Fennoscandia including salmon subsistence fishing. Wild salmon subsistence is no longer possible for the Sámi because of fish mortality caused by hydroelectric dams and high-seas overfishing of Atlantic salmon and colonization of Sámi lands limiting access to salmon.

Internally the Sámi are separated into a number of languages and dialects that territorially cut across national boundaries and are generally oriented at right angles from the coast toward inland highlands or mountains (Sara 2002:3). These linguistic territories encompass multiple ecological zones—coastal, riverine, lowland boreal forest, and upland tundra—each traditionally providing seasonally available resources (Hætta 1996:7-8). The food resources are similar to the indigenous food resources of the Yup'ik and Dena'ina and include terrestrial mammals: reindeer (caribou); a variety of small and large terrestrial mammals, elk (European moose), bear, hare; migratory birds and ptarmigan; coastal whales, seals and deep sea fish: cod, halibut, haddock, coalfish and sole; riverine/lacustrine fishing: Atlantic salmon, char, trout, and whitefish; and wild plant resources, especially berries (Anderson and Beach 1992:221). All resources were important, but among them reindeer and salmon were the most important because of their biomass, nutritional value, and harvesting efficiency. Access to these traditional resources has been negatively influenced, however, due to two centuries of colonial policies and, in the case of Atlantic salmon, hydroelectric dams and high-seas overfishing.

The Sámi subsistence lifestyle has been undercut by national policies such as the nineteenth and early twentieth century Norwegianization policy which was intended to open indigenous Sámi territory to colonial settlement by Norwegian farmers and commercial fishers

and transform Sámi from indigenous people to mainstream Scandinavians (Hætta 1996:43-45). Sámi scholars assert that the nineteenth century Norwegianization policy was based on Social Darwinist views which assumed the superiority of European society that, in turn, justified the forced assimilation and consequent cultural genocidal tactics aimed at presumed inferior cultures such as the Sámi (Lethola 2004:44; Paine 1994:158). The Norwegianization forced assimilation policy was primarily directed at language extinction undercutting Sámi identity and restricted access to subsistence resources (Lethola 2004: 40,44). In terms of the latter, the Norwegian government usurped entitlement to manage traditional Sámi salmon, reindeer and other resources (Paine 1994:158). This two-pronged colonial strategy forced Sámi to adopt a Norwegian identity and become northern European-style small farmers, intensive pastoralists or commercial fishermen, (Hætta 1996: 46-49).

Independent Sámi subsistence practices involving reindeer and salmon were gradually monetized and commercialized and brought under a European economic sphere (Hætta 1996:45-48). With specialization came land use conflicts, an increasing market economy, and efforts at state regulation by the Norwegian government undermining Sámi autonomy (Paine 1994: 145-155). The reindeer hunting and fishing Sámi of Anár (Aanaar), for example, lost prime fishing grounds to colonial occupation and reindeer habitat diminished forcing them to turn to farming to survive (Lethola 2004:42). Lehtola (2005:40) writes:

Norwegian colonization pressures in Sápmi [Sámi territory]...received state support. In this invasion of the best fishing places and netting grounds, the Norwegians very often were protected by new laws and local courts.

The 1852 border closing prohibited Finnish Sámi from fishing along the Norwegian coast of the Barents Sea, in 1871 Norway restricted Sámi fishing rights, and in the following years prohibited subsistence fishing weirs (Lethola 2004:37).

In the twentieth century the salmon resources of the Sámi were devastated by hydro-electric dams and high-seas overfishing of Atlantic salmon which together all but ended Sámi reliance on wild salmon. Post-World War II Norway engaged in an ambitious hydro-electric dam building program; 84 of the dammed rivers were salmon spawning rivers (Johnsen et al. 2011: 352). Though provisions were made for fish ladders or tunnels, the dams affected Atlantic salmon in three unforeseen ways: permanent or partial river bed drying, stranding of salmon due to planned flow changes, and smolt mortality as the fish are forced to migrate downstream through the turbines. Norwegian dams have reduced Atlantic salmon smolt production by as much as 20% with salmon runs completely exterminated in some rivers (Johnsen et al. 2011:352-3).

A much greater impact on Sami traditional subsistence fishing came from intensive overfishing of Atlantic salmon. In the 1960s Danish, Norwegian and Icelandic fishermen discovered the open-ocean habitat of most Atlantic salmon south and west of Greenland in the Labrador Sea and secondarily in the Norwegian Sea near the Faroe Islands at the juncture of nutrient rich ocean currents and created a high-seas salmon fishery (Montgomery 2003: 111-2, Hansen and Quinn 1998: 106-7). Highly efficient ocean-going freezer/trawlers using then-new nylon nets increased the salmon catch from 20,000 in 1960 to 500,000 in 1967 (Montgomery 2003:112). In 1968, Canada and the USSR supported by the United States and Britain through the International Commission for Northwest Atlantic Fisheries (ICNAF) proposed curtailing the

growth of high seas salmon fishing, but Denmark, Norway and Iceland blocked the resolution arguing there was no scientific evidence that overfishing was having an effect on salmon stocks (Montgomery 2003:113). From 1969 to the 1980s similar ineffective attempts were made by the United States, Canada and the Soviet Union to curtail high seas salmon fishing (Montgomery 2003: 116-8; Hansen and Quinn 1998:106). By the 1990s Atlantic salmon stocks were in precipitous decline and the commercial harvest of wild Atlantic salmon was essentially over. Today all commercially available Atlantic salmon is farmed salmon, a technology pioneered in Norway, and there are only a few places where wild Atlantic salmon are harvested, primarily those that spawn in the Teno and Nääämöjoki Rivers in far-northern Norway (Kitti nd).

With the decline of salmon and colonization practices, Sámi identity went into precipitous decline but has re-emerged, triggered by the Alta conflict in the 1960s protesting a hydroelectric dam on the Alta River, a wild Atlantic salmon spawning river, (Lethola 2004:72).

Demonstrations involving non-violent civil disobedience (including people blocking heavy machinery, hunger strikes, etc.) were held at the dam site and in Oslo (Lehtola 2004:72). The dam was built and opened in 1987 (2 km below the dam are seasonally dry), but the protest triggered intense feelings of Sámi identity and resulted in a resurgence in Sámi culture, language, the arts, music and political activism (Lethola 2004:72-84).

In 1989 in Norway the Sámi Parliament was established by the Norwegian Sami Association (1968) as a sovereign agency to strengthen Sámi culture and advocate for political action. Similar associations exist in other Nordic countries. Based on traditional usufruct, the Sámi claim rights to land, water and traditional livelihoods including wild salmon fishing (Lethola 2004: 84). According to Jouni Kitti, Member of the Sami Parliament, part of that revitalization is

to broaden harvesting of wild Atlantic salmon on the two remaining rivers that support harvestable, salmon the Teno (Tenojoki) and Näättämojoki (Kitti ND). Kitti (ND) writes:

The salmon stocks of the Tenojoki and Näättämojoki rivers are vital to the Saami and the preservation of these rivers as suitable fishing habitats from the standpoint of the Saami culture is a matter of the utmost importance.

The Sámi, through their Parliament, feel that Article 27⁴ of the United Nations Declaration on the Rights of Indigenous Peoples applies to their cultural situation.

Kitti (ND) states that:

Minority and indigenous groups have a right to the protection of such activities as fishing...The Saami are an indigenous people inhabiting an extensive area who have the right to maintain and develop their own language and form of culture to which among other things, salmon fishing traditionally belongs. In addition, the Saami as an Indigenous people in the Saami area should have the right to self-determination in respect to their language and culture.

The Sámi people have environmental concerns with the advent of increased copper and gold mine exploration. In 2008 the Nussir ASA mining company discovered an estimated 1.25 billion Euro mine in Finnmark and other mines have been proposed (Barents Observer, 2010). In 2009 the Sami Parliament rejected the newly passed Norwegian mining law intended to open

⁴ *Article 27, United Nations Declaration on the Rights of Indigenous Peoples*

States shall establish and implement, in conjunction with indigenous peoples concerned, a fair, independent, impartial, open and transparent process, giving due recognition to indigenous peoples' laws, traditions, customs and land tenure systems, to recognize and

adjudicate the rights of indigenous peoples pertaining to their lands, territories and resources, including those which were traditionally owned or otherwise occupied or used. Indigenous peoples shall have the right to participate in this process.

Finnmark for increased mining exploration and demanded instead that mineral development should be under Sámi control and benefit local Sámi communities (IceNews, 2009).

Principles of interlegality, a form of legal pluralism in which traditional customs are recognized by courts, are beginning to emerge (Svensson 2005). An example involves rights to river-based salmon fishing localities which traditionally were controlled by the *siida* (a non-kin based village cooperative) and transferred generationally. Svensson (2005: 53) states that in most cases *siida* rights of salmon fishing locations are now considered by the courts in instances of land use conflicts. Significant efforts to retain salmon fishing rights have been made in Norway with formation of the Coastal Fisheries Committee for Finnmark which proposed a Finnmark Fishery Agency, a six-member body composed of three members of the Sami Parliament and three by the County of Finnmark to administer what amounts to subsistence rights to Sami households (Pedersen 2008:37). At this juncture it is unclear whether the Sámi can regain resource control and whether wild Atlantic salmon can regain their place as a basic Sami subsistence food.

C. Ainu of Hokkaido, Japan

The Ainu are the indigenous people of Hokkaido, the northernmost island of Japan. Twenty-four thousand Ainu presently live on Hokkaido and have become a minority (among the 5,500,000 ethnic Japanese, Weijin or Yamato, who colonized Hokkaido) where most live in poverty and only 100 speakers of the language remain (Ichikawa 2008). The Ainu are inheritors of the Jomon culture, a salmon fishing, hunting and gathering culture which has the distinction of being the longest-lasting culture in the history of the world (10,000 B.C. to A.D. 650) (Yamaura and Yshiro 1999:40).

The Jomon subsisted on salmon, gathered wild plants especially acorns and beechnuts, hunted large game particularly deer and bear, and caught ocean fish and sea mammals (Higham 2005:259). Like other prehistoric salmon cultures (e.g. Dena'ina, Yup'ik) the Jomon were sedentary because of the abundance and predictability of wild salmon supplemented by other natural foods (Yamaura and Yshiro 1999:41). Initially the Jomon culture was widespread in Japan but after 250 B.C. the Jomon were displaced on Honshu by the Yayoi culture which had adopted or brought rice and millet agriculture from mainland Korea (Higham 2005:258-9). The Yayoi led to a series of cultures involving agricultural intensification and cultural complexity which eventually led to state formation on Honshu with the Kofun and later Yamato cultures beginning about A.D. 250 (Higham 2005:258-9). The agriculturist Yayoi did not, however, penetrate to Hokkaido where the Jomon culture remained as the Epi-Jomon culture until A.D. 650 (Yamaura and Yshiro 1999:40). The Epi-Jomon continued to subsist primarily on salmon and other wild foods and rejected adoption of agriculture, not because it is too far north, but because their salmon-based culture provided a better diet than an agricultural diet and because

salmon fishing is more stable and predictable than agriculture (Yamaura and Yshiro 1999:42). Archaeologists identify two cultures that bridged the transition between the Epi-Jomon and Ainu, the Okhotsk and Satsumon cultures with influences from the mainland including, curiously, raising domesticated pigs, an unusual practice for a hunting and gathering culture but one made possible by salmon-based sedentism (Yamaura and Ushiro 1999:42-45).

The Ainu salmon culture flourished on Hokkaido between A.D. 1200 and A.D. 1868, when the Meiji government of Honshu colonized and subjugated the Ainu. Ono (1999:36) points out the Ainu of this period, like preceding Hokkaido cultures, were river people and their most important food resource was salmon catching pink salmon, chum salmon and a species unique to the Far East, cherry salmon, using a variety of techniques including weirs, detachable spear-hooks, nets and traps. Anthropologists have estimated 300-1000 salmon were consumed annually by a household (Iwasaki-Goodman and Nomoto 1998:28-9)(approximately the same amount of salmon consumed today in the Nushagak and Kvichak watersheds by Yup'ik and Dena'ina, see Subsistence section III.B.).

In Ainu salmon are called *sipe* meaning “staple food” or “true food” and salmon were also referred to as *kamuy cep*, or “fish of the gods” or “divine fish” (Ichikawa 2008; Iwasaki-Goodman and Nomoto 1998:28). The Ainu had numerous ceremonies which expressed their relationship with nature, the most important of which was the Bear Ceremony, *Iyomante*, during which salmon were offered to the bear spirit (Iwasaki-Goodman 1998: 28). A related ceremony was *pet kamuy moni* the River God ritual. (Iwasaki-Goodman and Nomoto 1998:29-30). In one village the ritual involved a prayer asking the gods for a good salmon run because the people had been respectful of the river and had kept it clean. The latter refers to certain taboos and

practices that were followed to symbolically and actually keep the rivers unpolluted especially during salmon runs (Iwasaki-Goodman and Nomoto 1998:30-1). Like the Dena'ina and Yup'ik, the Ainu also had/have a First Salmon Ceremony which was practiced by households or groups of households in which prayers of thanks were given and the first catch was then eaten communally (Iwasaki-Goodman and Nomoto 1998:30-1).

In 1854 a trade agreement (the Kanagawa Treaty) between the United States and Japan resulted in civil war in Japan and the outcome was the Meiji government took power and engaged in trade with the West and imperial expansion including the forced assimilation of Ainu subjects on Hokkaido through the Hokkaido Colonization Office (Ichikawa 2008: Part III). The intent was to make the Ainu Japanese citizens as it resettled Japan with Waijin Japanese and for them to act as a buffer on its northern border with Russia (Maruyama 2003: 98).

As interpreted by Maruyama (2003:95-8), the Japanization policy of the Meiji Shogunate was intended to force the Ainu to adopt the Waijin culture of the dominant society of Honshu and effectively ended 11,800 continuous years of a subsistence salmon culture on Hokkaido from Jomon to Ainu ~1854. The Ainu were expected to adopt Waijin dress and were prohibited from having facial hair, tattoos and other symbols of identity and forced to change their names to Waijin names. The traditional ceremonies were prohibited and Buddhist temples were founded. The Ainu meat diet was considered savage and a "more civil" rice diet was encouraged (Maruyama 2003:95). In 1871 the Ainu were given houses and farming tools and resettled to agricultural areas although the land was less than suitable for rice and millet farming. The same year an Ainu language extinction policy was enacted and the children were taught in Japanese-

only schools. In 1883 the Ainu of the Sapporo area were prohibited from catching salmon and the catch channeled to Japanese immigrants (Maruyama 2003:98).

The program of Japanization included immigration and systematic development of Hokkaido including dams, filling wetlands, and straightening and cementing streams to control flooding for rice and millet agriculture decimating wild salmon runs (Ono 1999:36-7). In 1877 the Japanese government began restricting traditional Ainu net and weir fishing and eventually they were prohibited from salmon fishing everywhere; a situation still in practice today (Ichikawa 2008: Part III).

In 1899 the Hokkaido Former Aborigines Protection Act was implemented. Its intent was to further assimilation and establish the precedent that Ainu were Japanese and had no special indigenous rights (Maruyama 2003: 98-9; Siddle (1999b:108). The act furthered the practice of relocating Ainu and the land given to immigrants from Honshu (Siddle 1999b:108). Forced relocation had a horrific effect; for example in one case half of the Ainu residents of Shumushu died after five years when they were relocated to Shikotan and forced to take up agriculture and Buddhism (Siddle 1999b:108). The drastic change in diet from a salmon, deer, natural plant foods to a rice/millet diet had significant affects on the health and nutrition of the Ainu not only causing disease but, according to a first-hand account of John Batchelor a Christian missionary on Hokkaido in the late 1800s, also seriously damaged their dignity as human beings (Iwasaki-Goodman and Nomoto 1998:27, 33). The forced relocation was, in effect, a reservation system for social and political control, and by 1900 only 2 percent of the Hokkaido was Ainu (Siddle 1999a:72).

During the early 20th century Ainu response to colonization generally followed passive acceptance of assimilation into the dominant Japanese society through acceptance of government-funded self-help programs (creating dependent status), eradication of alcoholism, and attempts to revise the 1899 Hokkaido Former Aborigines Protection Act (Siddle 1999a:72-3). After WWII Ainu resistance to assimilation became more assertive, often radicalized, identifying with indigenous struggles for self-determination elsewhere in the world and the Ainu began to revitalize their culture in part through symbols of identity with a flag, a homeland reinstituting Ainu place names, taking control of their own history (Siddle 1999a:73) and through language revitalization (Iwasaki-Goodman and Nomoto 1998:34).

The Japanese Government responded to Ainu demands by replacing the Hokkaido Former Aboriginal Protection Act of 1899 with the Ainu Cultural Promotion Law of 1997 which recognized Ainu indigenous status, but also framed cultural revitalization in symbolic rather than actual terms giving, for example, access by permit to a small number of salmon for reinstitution of the First Salmon Ceremony, but not access to salmon for subsistence purposes (Iwasaki-Goodman and Nomoto 1998: 34, 40-1).. Moreover, the new law provided funds and for cultural practices such as dances and other performances including the First Salmon Ceremony as long as it was done for tourists as well as Ainu. According to (Iwasaki-Goodman and Nomoto (1998: 34, 40-1) to dismantle a culture through assimilation policies bring it close to extinction, and then to recast cultural revitalization in terms of tourism was, to the Ainu, both demeaning and humiliating. Today the Ainu cannot subsistence fish for salmon (Ichikawa 2008, Part III).

D. Papua New Guinea: The Ok Tedi Mine

There are important similarities between situations of the Yonggom communities along the Ok Tedi and Fly rivers in Papua New Guinea, as well as nearby lakes, and the Yup'ik and Dena'ina communities along the Nushagak and Kvichak and in Lake Iliamna and Lake Clark. Both populations are in small villages, scattered throughout a wetland landscape along fish-bearing rivers. Both populations practice subsistence for food resources, and both have local watershed populations numbering about 7000, with more people affected in the larger area. Both are dealing with large copper gold porphyry mines in a wet landscape with a large amount of surface water, and some of the corporate shareholders and participants are in fact the same, including potentially, BHP Billiton. Keystone Center (2008) has recently provided a stakeholder assessment and Dialogue Feasibility Study for Pebble Partnership, and five years ago, negotiated the settlement for the Yonggom when they appealed to the courts in Australia for help because their rivers had been destroyed, the fish were dead, and they were unable to farm along the river banks. They helped renegotiate the compensation payments several several years after the settlement of the lawsuit when environmental conditions continued to worsen despite the court case.

“Downstream from the mine, the Ok Tedi River now runs brown and cloudy, the color of coffee with milk. Trees which once lined the banks of the river with their dense, green foliage now stand barren and lifeless. No birds fly overhead. According to the Australian Conservation Foundation, the seventy kilometer corridor of the Ok Tedi River is “biologically dead.’ For the Yonggom people who live in the villages along the Ok Tedi River, the impact of the mine is devastating.” Anthropologist Stuart Kirsch describes the river system which he experienced both before and after the mining began. “Since the mine began production, the finely ground material

that it releases into the river regularly washes over the river banks into the surrounding low-lying rain forest, killing trees as far as two kilometers away from the river. While fish, prawns and turtles once provided important protein in the Yonggom diets, today they are rarely caught. The Yonggom complain that the few remaining fish in the local rivers have “no fat” “no blood” and “smell bad,” making the Yonggom afraid to eat them. Villagers said that the sago palms growing along the river and the other affected waterways fail to produce the usual starch-bearing pith that is the mainstay of their diets. By 1992, I heard complaints about food shortages, hunger, increased illness and malnutrition” (Kirsch, 1996).

The Yonggom have experienced twenty-five years of mining and post mining destruction of their environment. The Yup’ik and Dena’ina are at the beginning of experiencing working with a large mining company, still in the pre-permitting stage. The Ok Tedi began producing gold in 1984 and copper in 1987. “Although the original Environmental Impact Study called for a tailings dam in the mountains, Ok Tedi Mining Ltd. (OTML) sought permission to delay its construction when a landslide occurred at the initial site (Townsend 1998: 114). The government of Papua New Guinea temporarily granted the mining company permission for riverine tailings disposal. . . . When the Panguna copper mine in the Papua New Guinea province of Bougainville was forced to close in 1989 by local landowners, the resulting economic pressure led the state to permit OTML to continue operating without tailings containment (Filer 1997c: 59-61) . . . consequently more than 1 billion tonnes of tailings and waste rock have been released into the Ok Tedi River by the mine during its two decades of operation, causing riverbed aggradation, overbank flooding, and the spread of tailings and other mine wastes into the adjacent lowland forest” (Kirsch, 2006:16).

A cyanide spill from a valve accidentally left open for several hours, in 1984, released about 100 cubic meters of highly concentrated cyanide waste into the Ok Tedi River, killing fish, prawns, turtles, crocodiles and other riverine life for more than 100 kilometers downstream.

The second International Water Tribunal in Amsterdam (1992) found the mine guilty of violating the rights of the people living downstream (International Water Tribunal 1994: 49-85). “The tribunal concluded that Broken Hill Proprietary Ltd. (BHP), the majority shareholder and managing partner of the mine, had used its foreign earning power to coerce the Papua New Guinea government into violating its own environmental standards by permitting riverine tailings disposal. It criticized the state for allowing the mining company to monitor its own impacts (Kirsch, 2006:17).

In 1994, Australian solicitors brought a lawsuit against Ok Tedi Mining Ltd. and BHP on behalf of 30,000 indigenous plaintiffs, one of the largest claims in Australian history. The case focused on “negligence resulting in a loss of amenity” (Gordon 1997:154 in Kirsch 2006:20) which was based on the subsistence economy of the plaintiffs. The court recognized subsistence rights under the common law. The lawsuit was settled out of court, and included a Kina 110 million (about \$90 million at the time) compensation package for the 34,000 people living along the Ok Tedi and Fly Rivers. The main focus of the settlement was a commitment by BHP to implement the tailings containment following a government review of the options (Kirsch 2006:21). After four years the mine had still not put in a tailings dam or other containment measure, and the plaintiffs returned to the Victorian Supreme Court in Melbourne, charging BHP with breach of contract.

BHP withdrew from the Ok Tedi mine. “In the Mining Act of 2000 the Papua New Guinea Parliament endorsed BHP’s transfer of its 52% share in OTML to a trust fund that will support development projects in Papua New Guinea. In return the company and the government were indemnified against future claims relating to losses from pollution or damage to the environment resulting from the operation of the mine. . . the legal action against BHP Billiton and the Ok Tedi mine was settled out of court in January 2004, without reducing the mine’s environmental impact (Kirsch 2004). In that same month, Papua New Guineans sent letters objecting to the pending settlement, and asking the courts to address their concerns about the impacts of the mine on the rivers and forests. “Can your Honour tell us who will be responsible for the environmental damage that has been caused? . . . Your Honour, we pray that this Honourable Supreme Court may save our lives in the type of decision or verdict that is favourable to us.” The judge approved the out of court settlement with no action taken to reduce the environmental impact of the mine (Kirsch, 2004).

Several years later, Keystone was engaged by OTML to help negotiate additional compensation payments to the people living downstream from the mine. This process did not involve any effort to redress the fundamental environmental problems caused by the mine (Kirsch, pers. comm. Sept. 30, 2011).

VI. REFERENCES CITED

Alaska Community Database

n.d. Alaska Department of Commerce, Division of Community and Regional Affairs.
http://commerce.alaska.gov/dcra/commdb/CF_CIS.htm

Alaska Department of Natural Resources

n.d. Lake and Peninsula Borough Natural Hazards.
http://alaskacoast.state.ak.us/District/DistrictPlans_Final/LakeandPen/revised_phd/vol2_rphd/subsistence_natural_hazard/tokhanok.pdf

Alaska Native Tribal Health Consortium

n.d. Alaska Rural Utility Collaborative <http://www.anthc.org/cs/dehe/sustops/alaska-rural-utility-collaborative.cfm>

AFN Federal Priorities, 2011

2011 Alaska Federation of Natives
<http://www.nativefederation.org/documents/AFNFedPriorities-2011-APRIL.pdf>

Anderson, M. and H. Beach

1992 Saami. In *Encyclopedia of World Cultures*. L.A. Bennett, ed. Pp. 220-223, Vol. IV.
Boston: G.K. Hall and Company.

Balluta, Andrew

2008 Shtutda'ina Da'a Shel Qudel: My Forefathers are Still Walking with Me: Verbal Essays on Qizhjah and Tsaynen Dena'ina Traditions. J. Kari, ed. Anchorage: Lake Clark National Park and Preserve.

Barrents Observer

2010 Large Mineral Deposits In Finnmark. Barrents Observer. (online)
<http://www.barentsobserver.com/large-mineral-deposits-in-finnmark.4810618-16334.html> accessed November 12, 2011.

Barsukov, I (editor)

1887-8 Pisma Innokentia, Mitropolita Moskovskago i Kolomenskago. St. Petersburg. [Letters of Innokentia (Veniaminov) Metropolitan of Moscow and Kolomenskago]

Berkes, Fikret

1999 *Sacred Ecology: Traditional Ecological Knowledge and Resource Management*. Philadelphia: Taylor and Francis.

Berkes, Fikret, Johan Colding, and Carl Folke.

2000. "Rediscovery of Traditional Ecological Knowledge as Adaptive Management." *Ecological Applications*, 10(5), 1251-1262. DOI: 10.2307/2641280

Bersaglieri T. et al.

2004 Genetic Signatures of Strong Recent Positive Selection at the Lactase Genes. *American Journal of Genetics* 74:1111-1120.

Bersamin, Andrea, Sheri Zidenberg-Cher, Judith S. Stern, Bret R. Luick

2007 Nutrient Intakes are Associated with Adherence to a Traditional Diet Among Yup'ik Eskimos Living in Remote Alaska Native Communities: The CANHR Study. *International Journal of Circumpolar Health* 66(1):62-70.

Bersamin, Andrea, Bret R. Luick, Irena B. King, Judith S. Stern, Sheri Zidenberg-Cherr

2008 Westernizing Diets Influence Fat Intake, Red Blood Cell Fatty Acid Composition, and Health in Remote Alaskan Native Communities in the Center for Alaska Native Health Study. *Journal of American Diet Association* 108:266-273.

Billington, James H.

1970 *The Icon and the Axe: An Interpretive History of Russian Culture* New York: Vintage Books.

Birkmann, Jorn. Torsten Welle, Dunja Krause et al.

2011 World Risk Index: Concept and Results. *WorldRiskReport*, 2011.
<http://www.ehs.unu.edu/file/get/9018>

Birkmann, Jorn and Ben Wisner

2006 *Measuring the Un-Measurable: The Challenge of Vulnerability*. United Nations University: Institute for Environment and Human Society. Studies of the University: Publication Series UNU-EHS No. 5/2006 <http://www.ehs.unu.edu/file/get/3962>

Boraas, Alan S.

2007 Dena'ina Origins and Prehistory *In* Nanutset ch'u Q'udi Gu , Before Out Time and Now: An Ethnohistory of lake Clark National Park and Preserve. Pp. 31-40. Anchorage: Lake Clark National Park and Preserve.

2009 Moral Landscape of the Alaskan Dena'ina Presentation: Cultural Landscapes, Places, Identities, and Representations Research Cluster, Institute for Humanities Research. Arizona State University.

2010 An Introduction to Dena'ina Grammar: The Kenai (Outer Inlet) Dialect. *In* Kahtnuht'ana: The Kenai Peoples Language . Boraas and Christian, eds.
http://chinook.kpc.alaska.edu/~ifasb/documents/denaina_grammar.pdf.

In Press "What is Good, What is No Good": Traditional Dena'ina Worldview" *In* Dena'inaq' Huch'ulyeshi: The Dena'ina Way of Living. J.F. Suzi Jones, and Aaron Leggett, ed. Anchorage: Anchorage Museum and the University of Alaska Press.

Boraas, Alan and Michael Christian

2010 Kahtnuht'ana Qenaga, The Kenai People's Language. <http://chinook.kpc.alaska.edu/~ifasb/>

Boraas, Alan and Aaron Leggett

In Press Dena'ina Resistance to Russian Hegemony, Late Eighteenth and Nineteenth Centuries: Cook Inlet, Alaska. Accepted for publication Journal of Ethnohistory.

Boraas, Alan and Donita Peter

1996 The True Believer Among the Kenai Peninsula Dena'ina. *In* Adventures Through Time: Readings in the Anthropology of Cook Inlet. N.Y. Davis, ed. Pp. 181-196. Anchorage: Cook Inlet Historical Society.

2008 The Role of Beggesh and Beggesha in Precontact Dena'ina Culture. Alaska Journal of Anthropology 6(1 & 2):211-224.

Boyer, Bert B. Gerald V. Mohatt, Rosmarie Plaetke, Johanna Herron, et al.

2007 Metabolic Syndrome in Yup'ik Eskimos: The Center for Alaska Native Health Research (CANHR) Study. Obesity 15(11):2535-2540.

Brink, Frank and Jo Brink

1988 Tubughna: The Beach People. (video recording) Anchorage, Alaska: CIRI Foundation

Byrne, Samuel C. 2009. Persistent Organic Pollutants in the Arctic: A Report for the Delegates of the 4th Conference of the Parties, Stockholm Convention on Persistent Organic Pollutants, Geneva May 4-8, 2009. Anchorage: Alaska Community Action on Toxics.

Champagne, Duane.

1999. Contemporary Native American Cultural Issues. Walnut Creek, California: AltaMira Press.

Counihan, Carole.

1999. The Anthropology of Food and Body: Gender, Meaning and Power. New York: Routledge.

Coyne Amanda,

2011. "Southwest Alaska Votes Against Pebble Mine." Alaska Dispatch, Oct. 17, 2011.

Division of Environmental Health,

n.d. Drinking Water Program, Drinking Water Watch: <http://146.63.9.103:8080/DWW>

Dumond, Donald

1984 Prehistory of the Bering Sea Region *In* Handbook of North American Indians, Arctic. D. Damas, ed. Pp. 94-105. Washington: Smithsonian Institution.

1987 Eskimos and Aleuts. London: Thames and Hudson.

Ellana, Linda and Andrew Balluta

1992 Nuvendalton Quht'ana: The People of Nondalton Washington: Smithsonian.

Evanoff, Karen E, ed.

2010 Dena'ina Elnena: A Celebration. Anchorage: Lake Clark National Park

Fall, James

1987 The Upper Tanaina: Patterns of Leadership Among an Alaskan Athabaskan People.
Anthropological Papers of the University of Alaska 21(1-2):1-80.

Fall, James A. Dave Caylor, Michael Turek et al.

2005 Alaska Subsistence Salmon Fisheries 2005 Annual Report. Alaska Department of Fish and Game, Division of Subsistence. Technical Paper No. 316

Fall , James A. Theodore M. Krieg and Davin Holen

2009 An Overview of the Subsistence Fisheries of the Bristol Bay Management Area.
Anchorage, AK: Alaska Department of Fish and Game, Division of Subsistence.

Fall, James A., Davin Holen, Theodore M. Krieg, Robbin La Vine, et al.

2010 The Kvichak Watershed Subsistence Salmon Fishery: An Ethnographic Study. Alaska Department of Fish and Game, Division of Subsistence. Technical Paper no. 352

Fedorova , Svetlana, ed.

1973 The Russian Population in Alaska and California: Late 18th Century—1867. Kingston, Ontario: Limestone Press.

FEMA.

2009. Multi-Jurisdictional All-Hazards Mitigation Plan: Lake and Peninsula Borough. Retrieved February 19, 2012, from
http://commerce.alaska.gov/dca/planning/nfip/hazard_mitigation_Plans/Lake_Pen_Boro_MJ_HMP.pdf

Fienup-Riordan, Ann, ed.

1996 Agayuliyararput: Our Way of Making Prayer: Yup'ik Masks and the Stories They Tell. Seattle: Anchorage Museum of History and Art in conjunction with the University of Washington Press.

Fienup-Riordan, Ann

2010 A Guest on the Table: Ecology from the Yup'ik Eskimo Point of View. *In* Indigenous Traditions and Ecology. J.A. Grim, ed. Cambridge , Massachusetts: Harvard University Press for the Center for the Study of World Religions, Harvard Divinity School.

1994 Boundaries and Passages: Rule and Ritual in Yup'ik Eskimo Oral Tradition. Norman, Oklahoma: University of Oklahoma Press.

1990 Eskimo Essays. New Brunswick, NJ: Rutgers University Press.

Fred Hutchinson Cancer Research Center

2011. <http://www.fhcrc.org/about/ne/news/2011/03/24/omega-3-fats-study.html>: Fred Hutchinson Cancer Research Center, Seattle, Washington. Accessed 7-21-2011

Gaul, Karen

2007 Nanutset ch'u Q'udi Gu: Before Our Time and Now: An Ethnohistory of the Lake Clark National Park and Preserve. Anchorage: Lake Clark National Park and Preserve.

General Accounting Office

n.d. G.A.O. reports on communities that are vulnerable to flooding:
<http://www.gao.gov/new.items/d04142.pdf>

Gilbert, M.T., Kivisild, T., Gronnow, B., Andersen, P.K., Metspalu, E., Reidla, et al.

2008 Paleo-Eskimo mtDNA Genome Reveals Matrilineal Discontinuity in Greenland. *Science* DOI 10(1126).

Global Integrity: Independent Information on Governance and Corruption.

2009 Global Integrity Report: United States: 2009. <http://www.globalintegrity.org/report>.

Goudie, Andrew,

2006 *The Human Impact on the Natural Environment*, 6th Edition. Malden, MA: Blackwell Publishing.

Hætta, Odd Mathis

1996 *The Sami: An Indigenous people of the Arctic*. O.P. Gurholt, transl. Karasjok, Norway: Davvi Girji.

Haley, Sharman Michael Baffrey, Henry Huntington et al

2008 *Social and Economic Effects of Oil and Gas Activities In Assessment of Potential Effects of Oil and Gas Activities in the Arctic*. Anchorage: A Report of the Arctic Monitoring and Assessment Programme of the Arctic Council.

Henry, Michael, ed.

1967 *Lieutenant Zagoskin's Travels in Russian America, 1842-1844*. Toronto: University of Toronto Press.

Henson, E. C.

2008. The State of the Native Nations: Conditions under U.S. policies of self-determination: The Harvard Project on American Indian Economic Development. New York, New York: Oxford University Press

Higham , Charles

2005 East Asian Agriculture and Its Impact. *In* The Human Past: World Prehistory and the Development of Human Societies. C. Scarre, ed. Pp. 234-263. London: Thames and Hudson.

Hites, Ronald A., Jeffery a. Foran, David O. Carpenter, et al. 2004 Global Assessment of Organic Contaminants in Farmed Salmon. *Science* DOI 303:226-229.

Hollox, E.J. et al

2001 Lactase Haplotype Diversity in the Old World. *American Journal of Human Genetics* 68:160-172.

Holmes, Charles and Dave McMahan

1996 1994 Archaeological Excavations at the Igiugig Airport Site (ILI-002). Anchorage: Office of History and Archaeology

Hopkins, Scarlett E. Pat Kwachka, Cecile Lardon, and Gerald V. Mohatt

2007 Keeping Busy: A Yup'ik/Cup'ik Perspective on Health and Aging. *International Journal of Circumpolar Health* 66(1):42-50.

Human Relations Area Files

n.d. World Cultures Data base. <http://www.yale.edu/hraf/collections.htm>

Ice News

2009 Saami Parliament Against New Mining Projects in Finnmark. *In* Ice News. Ice News: News from the Nordics. <http://www.icenews.is/index.php/2009/08/10/saami-parliament-against-new-mining-projects-in-finnmark/>.

Ichikawa, Morihiro

2008 Understanding the Fishing Rights of the Ainu of Japan *Asia Pacific Environmental & Justice Journal* 1.

IRIN

2011 Diasters: New Risk Index Helps Identify Vulnerabilities. IRIN on line. <http://irinnews.org/report.aspx?reportid=93658>.

Iwasaki -Goodman and Masahiro Nomoto

1998 Revitalizing the Relationship between Ainu and Salmon: Salmon Rituals in the Present IN Parks, Property, and Power: Managing Hunting Practice and Identity within State Policy Regimes *Senri Ethnological Studies* (59):27-46.

Jacobson, Steven A

1984 The Yup'ik Eskimo Dictionary. Fairbanks: Alaska Native Language Center.

Johnsen, Bjorn Ove, Jo Vegar Arnekleiv, Lars Asplin, Bjorn T. Barlaup, et al.

- 2011 Hydropower Development—Ecological Effects Atlantic Salmon Ecology. *In* Atlantic Salmon Ecology O. Aas, Sigrud Einum, Anders Klemetsen and Jostein Skurdal, ed. Pp. 351-375. Oxford, United Kingdom: Blackwell Publishing.

Johnson , Walter

- 2004 Sukdu Nel Nuhtghelnek: I'll Tell You A Story: Stories I Recall From Growing Up on Iliamna Lake. Ed. James Kari. Fairbanks: Alaska Native Language Center.

Kalifornsky , Peter

- 1991 Dena'ina Legacy, K'tl'egh'i Sukdu: The Collected Writings of Peter Kalifornsky. Eds. James Kari and Alan Boraas. Fairbanks: Alaska Native Language Center.

Kari , James

2007 Dena'ina Topical Dictionary. Fairbanks: Native Language Center.

- 1996 Names as Signs: The Distribution of 'Stream' and 'Mountain' in Alaskan Athabaskan. In Athabaskan Language Studies, Essays in Honor of Robert W. Young. Edited by E. Jelinek, S. Midgett, K. Rice, and L. Saxon. Pp 443-475. Albuquerque: University of New Mexico Press

Kari , James and James Fall ed.

- 2003 Shem Pete's Alaska: The Territory of the Upper Cook Inlet Dena'ina 2nd Edition. Fairbanks: University of Alaska Press.

Kari, Priscilla Russell

- 1995 Tanaina Plantlore: Dena'ina K'et'una 4th Edition. . Fairbanks Alaska Native Language Center.

Kawagley , Oscar

- 2006 A Yupiaq Worldview: A Pathway to Ecology and Spirit. 2nd edition. Long Grove, Illinois: Waveland Press.

Keystone Center

- 2008 Draft Report: Stakeholder Assessment and Dialogue Feasibility Study for the Proposed Pebble Project, Southwest Alaska. Denver, Colorado: Keystone Center.

Kirsch , Stuart

1996. Acting Globally: Eco-politics in Papua New Guinea. *The Journal of the International Institute*. 3:3.

2004 "No Justice in Ok Tedi Settlement". *Cultural Survival Quarterly*, 28:2.

2006 Reverse Anthropology: Indigenous Analysis of Social and Environmental Relations in New Guinea. Stanford, CA: Stanford University Press.

Kitti, Jouni

- n.d. Wild Salmon Stocks in the Sami Region.
ggagg<http://www.elisanet.fi/kitit/jkitti/englanti/salmon96.htm>: Jouni Kitti homepage.
- Knott, Catherine.
1998 Living with the Adirondack Forest: Local Perspectives on Land Use Conflicts. Ithaca: Cornell University Press.
- Krauss, Michael E.
2007 Native languages of Alaska. *In* The Vanishing Voices of the Pacific Rim. O.S. Osahito Miyaoko, and Michael E. Krauss, ed. Oxford: Oxford University Press.
- Krieg, Theodore, Davin Holen, and David Koster
2009 Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska 2005. Alaska Department of Fish and Game, Division of Subsistence. Technical Paper no. 322
- Hansen L.P, T.P. Quinn
1998 The Marine Phase of the Atlantic Salmon (*salmo salar*) life cycle, With Comparisons to Pacific Salmon. . Canadian Journal of Fisheries and Aquatic Sciences Vol. 55(Supplement 1):104-118.
- International Indian Treaty Council.
2003. Mercury Contamination and Community Health in Northern California. San Francisco, California: International Indian Treaty Council.
- Lake and Peninsula Borough
2009 Multi-Hazard Mitigation Plan.
http://commerce.alaska.gov/dca/planning/nfip/Hazard_Mitigation_Plans/Lake_Pen_Boro_MJ_HMP.pdf
- Langdon , Steve J.
2002 The Native People of Alaska: Traditional Living in a Northern Land. Anchorage, Alaska: Greatland Graphics.
- La Vine, Robbin
2010 Subsistence Research and Collaboration: A Southwest Alaskan Case Study in Applied Anthropology. University of Alaska Anchorage, MA Thesis. Department of Anthropology.
- Lehtola, Veli-Pekka
2004 Sámi People: Traditions in Transition. L.W. Müller-Wille, transl. Fairbanks: University of Alaska.

Lesperance, Francois. 2010. "The Efficacy of Omega-3 Supplementaion for Major Depression: A Randomized Controlled Trial." Rep. *Journal of Clinical Psychiatry*. UdeMNouvelles. Centre Hospitalier De L'Universite De Montreal, 22 June 2010.

Lowe, Marie

2007 Socioeconomic Review of Alaska's Bristol Bay Region. Ms prepared for North Star Group. Institute of Social and Economic Research. University of Alaska Anchorage.

Lynch , Alice J

1982 Qizhkeh: The Historic Tanaina Village of Kijik and the Kijik Archeological Distric. Fairbanks: Anthropology and History Preservation CPSU.

Makhoul, Zeina, Alan R. Kristal, Roman Gulati, et al.

2010 Associations of very high intakes of eicosapentaenoic and docosahexaenoic acids with biomarkers of chronic disease risk among Yup'ik Eskimos. *American Journal of Clinical Nutrition* 91:777-785.

Marsh, Bill.

2008. "Illinois is Trying, It Really Is, But the Most Corrupt State is Actually . . .": [www.nytimes.com/2008/12/14/week in review/14marsh.html](http://www.nytimes.com/2008/12/14/week_in_review/14marsh.html).

Maruyama, Masazumi

2003 The Ainu: A Discourse on Being Japanese. *In* The Emerging Monoculture: Assimilation and the "Model Minority". E. Kramer, ed. Pp. 85-109. Westport, CT: Praeger Publishers.

Maximovitch, St. John

n.d. Writings of St. John Maximovitch, Vol. 2011.
<http://www.holytrinityorthodox.com/events/01-19-2006/index.htm> .

Merton, Robert K.

1938 Social Structure and Anomie. *American Sociological Review* 3(5): 672-682.

Montgomery, David R.

2003 King of Fish: The Thousand-Year Run of Salmon. Cambridge, MA: Westview Press.

Nemets, H., et al.

2006. "Omega-3 Treatment of Childhood Depression: A Controlled, Double-Blind Pilot Study." *American Journal of Psychiatry*, Volume 163(6), pages 1098-1100. DOI: 10.1176/appi.ajp.163.6.1098

Nushagak-Mulchatna Watershed Council

2007 Nushagak River Watershed Traditional Use Area Conservation Plan. Dillingham and Anchorage: Bristol Bay Native Association, Curyung Tribal Council, and The Nature Conservancy.

O'Brien, Diane, Rosemarie Plaetke, Bret Luick,

2011 Developing a Novel Set of Diet Pattern Biomarkers Based on Stable Isotope Ratios. <http://canhr.uaf.edu/Research/NevelSet.html>. doi 7/21/2011

O'Brien, Diane M., Alan R. Kristal, M. Alyssa Jeannet, et Al.

2009 Red blood cell delta15N: a novel biomarker of dietary eicosapentaenoic acid and docosahexaenoic acid intake 1-4. *American Journal of Clinical Nutrition* 89:913-919.

O'Harra, 2011. "Study of Alaska Natives confirms salmon-rich diet prevents diabetes, heart disease." *Alaska Dispatch* March 29.

Ono, Yugo

1999 Ainu Homelands: Natural history from ice Age to Modern Times. *In* Ainu: Spirit of a Northern People. W.W.Fitzhugh and C.O. Dubreuil, eds. Pp. 32-38. Washington D.C.: Smithsonian Institution Press.

Orthodox Church in America

n.d. Great Blessing of Water Highlights Threat to Alaska Native Way of Life. <http://oca.org/news/archived/great-blessing-of-water-highlights-threat-to-alaska-native-way-of-life>

Osgood, Cornelius

1976 [1937] *The Ethnography of the Tanaina*. New Haven, CT: Human Relations Area Files Press.

Paine, Robert

1994 *Herds of the Tundra: A Portrait of Saami reindeer Pastoralism*. Washington D.C.: Smithsonian Institution Press.

Pedersen, Steinar

2008 Formalizing Indigenous Fishing Rights. *Samudra: International Collective in Support of Fishworkers* (Issue 51):35-37.

Peng, Yi et al.

2010 Genetic Variations in Tibetan Populations and High Altitude Adaptation at the Himalayas. *Oxford Journals, Society for Molecular Biology and Evolution* 28(2):1075-1081.

Perry, Bruce D.

2006. "Applying Principles of Neurodevelopment to Clinical Work with Maltreated and Traumatized Children: The Neurosequential Model of Therapeutics." IN Boyd, Nancy, ed. 2006. *Working with Traumatized Youth in Child Welfare*, New York: The Guilford Press.

Rooth , Anna Birgitta

1971 *The Alaska Expedition 1966: Myths, Customs and Beliefs Among the Athabascan Indians and the Eskimos of Northern Alaska*. Berlingska Boktryckeriet, Lund, Sweden.

Rosay , Andre, Greg Postle, Darryl S. Wood, and Katherine Tepas

2008 Sexual Assaults Reported to Alaska State Troopers. *Alaska Justice Forum* 25(1-2):6-9.

Rubicz , Rohina, Theodore G. Schurr, and Crawford, Michael H

2003 Mitochondrial DNA Variation and the Origins of the Aleuts. *Human Biology* 75(6):809-835.

Sandelson, Michael and Ramona Tancau

2010 Toxic Norwegian Farmed Salmon Poisons French Food Relations. *In The Foreigner: Norwegian News in English*. The Foreigner. <http://theforeigner.no/pages/news/toxic-norwegian-farmed-salmon-poisons-French-food-relations>.

Sara, Ándde

2002 *Regional Characteristics of Sápmi and Sami People*. Sámi Instituhtta: Nordisk Samisk Institutt.

Siddle, Richard

1999a *Ainu History: An Overview*. *In Ainu: Spirit of a Northern People*. W.W.F.a.C.O. Dubreuil, ed. Pp. 67-73. Washington, D.C.: Smithsonian Institution.

1999b *From Assimilation to Indigenous Rights: Ainu resistance Since 1869*. *In Ainu: Spirit of a Northern People*. W.W.F.C.O. Dubreuil, ed. Pp. 108-115. Washington, D.C.: Smithsonian Institution.

Simonsen, Tatum S. et al.

2010 Genetic Evidence for High-Altitude Adaptation in Tibet. *Science* 329:72-74.

Sincan, Nicoleta-Madalina

2011 Updated: Norwegian Farmed Salmon a Swimming Vegetable. *In The Foreigner: Norwegian News in English*. <http://theforeigner.no/pages/news/updated-norwegian-farmed-salmon-a-swimming-vegetable>.

State Integrity Investigation

2012 *Keeping Government Honest: Alaska*. A project of the Center for Public Integrity, Global Integrity, and PRI Public Radio International. <http://www.stateintegrity.org/alaska>.

Stickman , Karen, Andrew Balluta, Mary McBurney, and Dan Young

2003 K'ezghlegh: Nondalton Traditional Ecological Knowledge of Freshwater Fish. Final Report Fisheries Project 01-075 funded by the U.S. Fish and Wildlife Service, Fisheries Information Services. Anchorage: U.S. Fish and Wildlife Service.

Svensson, Tom G.

2005 Interlegality, A Process for Strengthening Indigenous Peoples' Autonomy: The Case of the Sámi in Norway. *Journal of Legal Pluralism* No. 51:55-77.

Swallow, D.M.

2003 Genetics of Lactase Persistence and Lactose Intolerance. *Annual Review Genetics* 37:197-219.

Swan, Clare and Alexandra Lindgren

2011 Kenaitze Salmon Subsistence on the Kenai Peninsula, Alaska. Paper presented at the Fishing Peoples of the North Conference, Anchorage, Alaska September 2011.

Tenenbaum, Joan M.

1984 *Dena'ina Sukdu'a: Traditional Stories of the Tanaina Athabaskans*. Fairbanks: Alaska Native Language Center.

Tetrattech.

2010. Imperiled Community Water Resources Analysis. Prepared for Immediate Action Workgroup: An Advisory Group of the Governor's Climate Change Sub-Cabinet Research Triangle Park, NC: Tetrattech.
www.climatechange.alaska.gov/docs/iaw_tt_imperiled_h20_30jun10.pdf

Thornton , Thomas E.

1998 Alaska Native Subsistence: A Matter of Cultural Survival. *Cultural Survival Quarterly* at <http://www.culturalsurvival.org/ourpublications/csq/article/alaska-native-subsistence-a-matter-cultural-survival> 22(3).

Tishkoff, Sarah A. et al

2007 Convergent Adaptation of Human Lactase Persistence in Africa and Europe. *National Genetics* 39(1):31-40.

Townsend, Joan B.

1981 Tanaina in Subarctic Volume 6, *Handbook of North American Indians*. June Helm volume editor pp 623-640. Washington: Smithsonian.

Troll , Tim

- 2011 Sailing for Salmon: The Early Years of Commercial fishing in Alaska's Bristol Bay 1884-1951. Dillingham, Alaska: Nushagak-Mulchatna/Wood Tikchik Land Trust.

United Nations

- 2008 United Nations Declaration on the Rights of Indigenous Peoples.
http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf United Nations.

United States Census, Alaska

- 2010 U.S. Census [Http://quickfacts.census.gov/qfd/states/02000.html](http://quickfacts.census.gov/qfd/states/02000.html)

United States. Census Bureau.

2012. *Labor Force, Employment, and Earnings Table*. Retrieved February 19, 2012, from <http://www.census.gov/compendia/statab/2012/tables/12s0629.pdf>

United States Department of Labor.

- 2009, Labor Force Statistics from the Current Population Survey: How the Government Measures Unemployment. U.S. Bureau of Labor Statistics. October 16, 2009. Retrieved February 19, 2012, from http://www.bls.gov/cps/cps_htgm.htm#nilf

USDA Factbook

- n.d. United States Department of Agriculture Factbook, online.
<http://usda.gov/factbook/Chapter2.pdf>.

VanStone , James W.

- 1967 Eskimos of the Nushagak River: An Ethnographic History. Volume 15. Seattle: University of Washington Press.

Woodward, Kristin

- 2011 Omega-3 fat rich diet may reduce obesity-related diseases: Fish-rich diet linked to reduction in markers of chronic disease risk among overweight Yup'ik Eskimos. Center news, Fred Hutchinson Cancer Research Center. March 28, 2011.

World Risk Report

- 2011 Indicators of Local Risk. <http://www.ehs.unu.edu/file/get/9018>

Xin Yi et al.

- 2010 Sequencing of 50 Human Exomes Reveals Adaptation to High Altitudes. *Science* 329:75.

Yamaura, Kivoshi and Hiroshi Yshiro

- 1999 Prehistoric Hokkaido and Ainu Origins. In *Ainu: Spirit of a Northern People*. W.W.Fitzhugh and C.O. Dubreuil, eds. Pp. 39-46. Washington, D.C.: Smithsonian Institution.